JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CXVI., No. 2528.——TUESDAY, OCTOBER 24, 1911.

EDITORIAL NOTES—GAS, &c.

Statutory Gas Companies' Acts.

THE Statutory Companies' Acts of the past session reviewed in other columns this week have few points about them to specially distinguish them. Of the group, that of the Gaslight and Coke Company—which brings to a head the project for the annexation of the Barking and Chigwell Companies—is the most imposing member, and as such most interesting. The interest increases as one compares the Act with the Bill, and finds how faithful a representation the latter is of the former. The measure has gone through as it was introduced almost to the letter, which is something that has to be placed to the credit of the Gaslight and Coke Company and to the administration. It is known that agreements were made by the Company with certain bodies; but these agreements have been executed outside the Act, and so the latter is not burdened with them. In to-day's group of Acts are illustrations of how, in the progress of the measures through Parliament, there has been a shaping-up of clauses to make them conform with the parliamentary models; and the instances show how entirely useless it is for promoters to depart from the prescribed patterns, unless there is some very good and substantial reason for asking Parliament to allow the variation. Though if there were not fresh conception and initiative, there would not be progress in harmonizing legislative condition with practical and current circumstance. Under their special and exceptional state, the Gaslight and Coke Company were allowed to depart from one model clause, but only after an amount of argument before the Unopposed Bills Committee. The change has reference to the special purposes fund clause, which was modified so that the appropriations for this purpose may be equal to ½ per cent. (instead of 1 per cent.) on the paid-up capital, with a maximum accumulation at any one time equal to one-twentieth, instead of one-tenth, part. The carry-forward of divisible profits, too, in their case, is unlimited, instead of being restricted to an amount equal to the sum that is required for a year's dividend on the share capital.

In this matter of the balance of divisible profits, the Swansea Gas Company have received very definite marching orders. When the balance exceeds a sum equal to a year's dividend for the time being on the share capital, the excess, in their case, is to be applied first to the filling-up of the reserve fund, and any balance remaining is to be devoted to the reduction of the price of gas. Within two years after the passing of the Act, the Company are to invest their reserve fund in accordance with section 31 of the Gas-Works Clauses Act, 1847, which provide for investment in "Government or other securities." It is clear, too, from changes made in the clause dealing with the provision and service by the Company of independent lighting and power installations on consumers' premises, that the Corporation are rather fearful of any power being afforded that will give the competitors of the electricity undertaking a fresh effective weapon. For we see the Company are not to be allowed to provide plant for electricity generation, though there is nothing to prevent them supplying the power for the driving of such plant; and in regard to the provision and working by the Company of acetylene, gasolene, or suction-gas plants, where there are not facilities for connection with the ordinary gas-distribution system, the Corporation have secured the insertion of the stipulation that the power obtained under this clause is only to have temporary effect, without their consent, pending the laying of a main from which the premises concerned can be conveniently supplied with gas from the Company's works. It does not appear to take much to startle some suppliers of electricity into action in opposing movements about which they talk contemptuously until they show the true state of their feelings by hostility.

The Enfield, Luton, Swansea, and Tamworth Companies have secured stand-by clauses—the two last-named in respect both of gas and electricity. In the case of Swansea, however, domestic stand-bys are excluded from the scope of the provision. This has been a subject of discussion on previous occasions, and recently; so that we will not retrace the argument on this occasion. The Swansea Company, however, are relieved from the necessity of supplying gas for any purpose other than lighting or domestic use in any case where a main is insufficient for the purpose, or if such supply would threaten the sufficiency of the service for lighting purposes. The Tamworth Company are exempt from the supply of gas where suction gas is used, if the supply would interfere with, or jeopardize, the private lighting. We think it rather a pity that the limiting term of "suction gas" was used in the clause. A more comprehensive one would have been better. Further evidence is seen as to the epidemic among road authorities for more particular protection than they have hitherto secured, though what they have received has been sufficient. There are cases again in this section of the review of the exemption of road authorities from liability for damage by steam-rollers up to 15 tons weight. There are cases, too, in which it is again prescribed that, in the laying of pipes in future, a 2 ft. 6 in. cover shall be provided. In the Tamworth Bill, however, we have a distinction made between cast-iron and steel pipes—the cover required for the former is to be 2 ft. 6 in., while for the latter 2 ft. will suffice.

The Railway Commissioners' Judgment.

INDIVIDUALLY and collectively—particularly in industrial and trading life—we are all concerned in the uninterrupted working of our railway systems; and therefore there has been a general awaiting, with more than ordinary interest, the issue of the report of the recently appointed Special Commission to inquire into the working of the railway conciliation and arbitration scheme of 1907. Before these lines are printed, the Commissioners will have been made fully aware of the country's appreciation of the despatch they have exercised in their inquiry, and in declaring their judgment upon what they have heard. Their report issued last Friday is a unanimous one, and that is a matter of importance in showing the country (as it distinctly does) that, while modifications are desirable in the direction of simplifying the procedure associated with the working of the conciliation system, this alone was not sufficient to justify the men throwing the country into the turmoil that they did, through their headstrong action upon the advice of their Unions, and in violation of honourable compact, in the middle of the summer. The whole findings of the Commission (apart from any question as to our personal feelings as to the real value, in securing industrial peace, of conciliation and arbitration settlements that cannot be enforced) are those that were anticipated from a body of judicially disposed and common-sense men; for they are precisely in accord with the views that, outside the trade unionist and socialistic worlds, are held pretty generally by the whole community.

The findings will not, of course, be to the liking of the trades unions concerned; for though the Commission have carefully drafted their report so as not to excite anger or cause it to appear in any way deliberately offensive, still, reading between the lines, the Unions are roundly condemned in their actions, and there is an intentional setting of them in their proper position, or rather in the position that indulgence only can give them, as between employees and employers. The most pronounced dictator the world has ever seen could not have taken a more despotic stand than the Unions have done in intermeddling between employers and employed; and the audacious claims by the Unions to recognition on the part of the Railway Companies, despite the conciliation machinery in existence as the result of the agreement of 1907, shows where they intend, if they can

manage it, to land themselves in the very management of the railway systems. But the Commissioners have expressed their views; and if the Unions attempt to override the judgment, they will alienate the sympathy of the public from themselves and their cause beyond any prospect of immediate recall. What say the Commissioners: "We "think that, with their great responsibilities, the companies "cannot, and should not be expected to, permit any inter- "vention [on the part of the Unions] between them and "their men on the subjects of discipline and management." No person but an extreme trade unionist and socialist would think otherwise. But the Commissioners are fair. They think there might be concession in the matter of recognition where discipline and management are not involved. There is not so much objection to this limited liberty as to whole and unfettered recognition; although, beyond the abstract advantage of giving the men an outside channel of advocacy, we cannot see that there is any substantial reason why there should be any recognition of any right centring in the Unions to intervene between those who employ and those who are employed. The Unions are those who organized the recent stoppage before all the available conciliation machinery had been exhausted—an action that the Commissioners condemn. These are the Unions who let loose all the inconvenience, waste, peril, intimidation, riot, and so forth that were the accompaniments of the recent strike. These are the Unions for whom partial recognition is now recommended! The spirit of conciliation certainly runs through the report.

The details of the recommendations of the Commissioners for rendering the conciliation boards more serviceable have been published in the Daily Press, and will have been digested by all interested. The Central Board is considered superfluous, and is recommended for dissolution; while the Sectional Boards are to be invested with powers and conditions that will make them of greater use. The suggested revision of the machinery (into the details of which we will not enter) shows that there was some reason for complaining that it was too cumbrous for its purpose. But of what avail the patching of the old machinery if the leaders of the men's Unions have determined that all such method of settling labour troubles weakens their own bodies and their power, and tends to reduce them in the eyes of the constituents to a state of inutility? Modification of the machinery will not lessen the number of spokes that self-interest will interpose in order to impede the working, and bring the Unions to the front. If there is one subject over which pessimism will get into the ascendant position, it is this one when it is examined in the light of the incidents of the past. However, we hope, as all right-thinking men will do, that out of the inquiry good may come, and that the railway workers (who are, generally speaking, of a different type intellectually to many in certain other industrial occupations that could be named) will see that, in the judgment of disinterested men, there is a side to the questions that were at issue other than the particular one presented by the men.

Attaching Gas Workers on the Continent.

It is not intelligence to the students of social and industrial conditions to be told that on the Continent there are labour disturbances which rack communities and produce loss to both capital and labour just in the same manner as in this country. So far as the gas industry on the Continent is concerned—though by good wages and pension and other funds, and in other ways, close regard is paid to the amelioration of the conditions of the workers—there has not been found a method of applying the system of co-partnership on the lines laid down by Sir George Livesey, and now so largely practised in this country. That this is so is not due to any want of sympathy on the part of the Boards of Directors. The composition of these Boards is alone a sufficient contradiction of any such suspicion, if it arose. The disability lies in the circumstances under which the Companies carry on the business of gas suppliers on the Continent. They have no sliding-scale as to dividend and price to serve as a basis; and the limited concession system and financial conditions that apply to these concerns are other obstacles. The European Gas Company, however, whose operations are carried on in France, have found one way out of the difficulty, and a way that will give their men a feeling of direct and perceptible, and ultimately tangible, interest in the prosperity of the undertaking. The proposal was laid before the shareholders by their venerable Chairman (Mr. R. Hesketh Jones) on Tuesday last, and his explanation of the terms, together with the statement of Mr. H. E. Jones, carried the shareholders to a unanimous vote in favour of the scheme.

Without going into details of the new scheme, the position, briefly put, is this: At the present time, the Company pay a considerable sum of money for pensions; but there is no formal scheme in existence. Therefore, the Company are, in the first place, going to make the pension scheme a formal one, although still dependent on the pleasure of the Board. But only those of the existing workmen who signify their desire to do so will continue under the scheme. There is an alternative; and this is the interesting plan that will in future exist, will take precedence of the old scheme, and will in time, as the old scheme is extinguished (as it must eventually be through no new men coming under it), be the sole survivor of the two. Under the new scheme, every employee will be a depositor in the Caisse Nationale—a sort of national savings and pensions bank under the supervision of the State; and when there has been an uninterrupted service in the Company for five years (military service and illness excepted), the Company will pay per annum on the employee's special pass-book in the Caisse Nationale a sum equal to 8 per cent. on his salary or wages from the sixth year to the tenth year (inclusive) of service, and thereafter 10 per cent. This will give what we have called the direct and perceptible interest over and above salaries and wages in the business of the Company; the tangible effect comes later under the pensions and insurances or other benefit derivable from the Caisse Nationale.

That is, in brief, the scheme. The details as to the conditions, the advantages, the protection of the men and the Company, and all else that is pertinent to the matter, form the substance of the speech of the Chairman at the meeting, and, for information as to them, we must refer readers to the speech. The scheme will at the outset cost the Company somewhat more than their present pension scheme; but the moral effect through the new bond of attachment will be worth the additional expense—giving the men, as it does, a title to something to which they could not claim to be entitled before as a condition of their employment. We congratulate the Directors of the Company (the Managing-Director, Mr. W. Williams, especially), upon finding this way out of the difficulty that faced them, through possessing no practical foundation upon which a scheme of co-partnership could be erected, of giving to the men a direct interest in the Company's business, though, of course, it unavoidably falls short of the system which imparts a monetary interest rising or falling in settled ratio with the prosperity of the business. But we have here a serious effort to do something on the same lines that will serve the men well in their latter days; and we sincerely hope that all that is expected of it will accrue.

Gas-Fire Design.

The subject is seasonable; and the article upon it that Mr. H. James Yates has communicated for publication in our columns is particularly appropriate at a time when the gas industry requires to be protected by the good sense of every gas-fire manufacturer in not putting upon the market productions that, through indifferent and unscientific design, are likely to do an injury to the growing good character of gas-fires—not only as a convenience, but as an economical means of household warming. We cannot, however, think that, with the large output of modern built gas-fires, their economic aspects are not receiving both due attestation and circulation. The growing demand denies the contrary. But the object of Mr. Yates's contribution is to emphasize the vital considerations in the design of a gas-fire; and, where these considerations apply, they are the very seats of weakness if there is neglect of any of them. In bringing forward what may be regarded as both an appeal and a protest, one cannot close his eyes to the fact that the motives of one in the position of Mr. Yates in writing such an article are liable to be misconstrued; but if the reader of the communication absorbs at least some of the spirit of the opening paragraph, the remainder of the article will be ascribed not to a pedant or hypercritic in the matter of the technic of gas heating, but to one who has the best interests of the gas-heating business at heart, and one who takes his stand on scientific and prudent grounds.

The prudent grounds are found in the appeal that the contributor of the article makes to the self-interest of makers by doing all they can, through scientific design, to stamp out

the ill-favour into which the old crude construction brought gas-fires, and not to create fresh ill-favour by clinging to traditional empiricism, and disregarding the teachings of investigation. All such disfavour (for which there is not the slightest reason to-day, given proper construction) is derogatory to the mutual interests of the gas-fire and the gas-supply industries; and therefore it should be studiously avoided. The gas-fire firms whose work—every constituent of whose productions—has scientific basis know that even their own businesses can be injuriously affected by a competitor who has no scrupulous regard for correctness of design, and therefore no conscientious regard for the resultant effect that may (and probably will) lose the security of the goodwill and recommendation of the user of his goods. There is another danger; and it is that the desire for novelty occasionally appears to lead, in design, to a divorce from scientific principles. An instance of this is in the shape of the fuel. What on earth is the good of having novelty in the cross section of the fuel, if the section is not conformable with the shape of the flame. To gain novelty by the sacrifice of efficiency is not, in this matter, by any means politic. That, however, is only one point named by way of illustration.

Many matters of equal and greater practical importance are dealt with in the article; and they all go to emphasize the need, in gas-fire design, to treat the whole construction as something containing many essentials, each and every one of which contributes in some degree to the ultimate goal of a desirable high efficiency. No maker should allow a gas-fire to go out of his works until he can say that into the fire, used at its maximum capacity, so many heat units are introduced in the form of gas, and that the thermal value so represented can be fully accounted for. This is the test of proper construction; and to come out of such a test with high result is what Mr. Yates claims every gas-fire maker should aim at. If one or more makers can get flue-loss in the matter of heat units down to 15 to 25 per cent., the radiated heat up to 55 per cent., and the convected heat reduced to 20 to 25 per cent. at low temperature, it is possible for all to do it, provided there is proper design. If the efficiency of an electric radiator was 100 per cent.—if every B.Th.U. of the 3420 represented by a unit of electricity consumed per hour was accounted for in useful heat to the householder, and if the unit cost 1d.—a 55 per cent. radiation efficiency alone of a properly constructed gas-fire would mean three times more useful heat to the householder using a pennyworth of gas of (say) 550 B.Th.U. per cubic foot; and at 2s. 6d. per 1000 cubic feet. Nothing can take away from the gas industry this difference in heating value. The makers of gas-fires have to see to it that all their appliances preserve to the gas industry, of which they are a responsible part, the full benefit of this commercially valuable superiority, which is added to materially if we take convected heat also into account. Scientific work in every part of the gas-fire will guard the steps of the makers to this desirable end.

Wanted, Travelling Instructors.

It is unquestionable that in these times the weakest part of many gas undertakings is the outdoor fittings department. Traditional method and knowledge are found in abundance; and from ancient ways and knowledge, the men have small chance to detach themselves, as they cannot, on their own initiative and from their own opportunities, create the means for improving their practice and knowledge. This weakness is well-recognized by most of the chief gas officials. The weakness in itself is a serious disadvantage to the gas undertakings concerned, as it may be accepted as a truism that every gas-fitter well instructed in modern gas appliances is a valuable commercial asset to any undertaking. In certain of the larger gas undertakings, the difficulty has been surmounted by specially arranged classes and lectures, and by giving facilities for reaping more or less knowledge pertinent to the gas-fittings department. The Manchester Institution of Gas Engineers and the Welsh Association have recognized the need; and both organizations have been working to ascertain if something of a co-operative character for special educational work of the kind in view cannot be arranged. The lines they have taken, but not so far with any conspicuous success, are well known. But co-operation of another form is an aspect of the general subject that is important. Influential undertakings can legislate in this matter for themselves; but it is the undertakings who cannot afford, or who do not require, a permanent member of the staff to look after the education of their outdoor staff whose interests are under consideration. Some of the industry's trading firms have placed members of their staffs at the disposal of gas undertakings for lectures on the subjects in which they are specialists. This is good so far as it goes. Nothing could be better in its way. But it cannot be regarded as sufficient to displace the theoretical and practical teaching needed in the several lines of work that to-day fall to the outdoor gas department. As a supplement, such lectures are of considerable value; and those firms who allow their specialists to render service in this way are benefactors not only to the gas-supply industry, but to all those firms who trade in appliances of the order with which the specialist deals, and, among the number, naturally and deservedly, to the firm concerned. But there is a limit to the service that can be rendered in this direction.

Therefore it seems that what is wanted are travelling district instructors, each one of whom could obtain an adequate remuneration by the co-operation of the gas undertakings in a given district. The engineers and managers of gas undertakings, we believe, would welcome the services of such instructors; but then arises the first difficulty that has to be surmounted. Chief officials have to convince their Committees or Boards that the necessary expenditure will be of profit to the undertakings. To some administrators of gas undertakings a gas-fitter is a gas-fitter, and should from his very position know all about his business, up to the very latest improvements, whether in gas lighting, house or industrial heating, water-heating, gas power, and so on, with a pretty general knowledge concerning the electrical competitor, in order to be in a position to defend the commodity by which he earns his living. This is, of course, a mistake born of ignorance. But when the difficulty has been overcome, another faces.

This second difficulty was well put, in this office, only a few days ago, by an official of a gas undertaking of no mean order. He voluntarily admitted that what was wanted in connection with his own undertaking was a gas-fitters' instructor in the construction, fitting, and use of modern gas appliances, and generally in the theory and practice of work connected with gas utilization. His trouble had been to find such a man in or near his area who could possibly arrange a connection with neighbouring undertakings in a matter of this kind. Our friend wanted an instructor of wide ability and character. The sort of man required is one who knows his business, who has combined theoretical study with workshop practice, who can keep himself *au fait* with new gas appliances, who can express himself so that the workmen can understand him, and whose demeanour towards the men is not that of the pompous village academy pedagogue. Nor is a man wanted who revels in figures carried to the third and fourth place from the decimal point. Such a man cannot possibly interest the gas-fitting craftsman, and cannot be much good to him. A paragraph appearing in the "Journal" for the 10th inst., headed "Instruction for Plumbers and Gas-Fitters," stated that a syllabus of instruction submitted by the Manchester Institution of Gas Engineers to the Ironmongers', Plumbers', and Gas Fitters' Associations, had been referred back, on the ground that it was "too scientific." The gas-fitters' instructor has to guard against being "too scientific." He must also know how to handle the tools used by gas-fitters if he wants to gain their confidence (as he must do to be useful), and not their sneers directly the door of the instruction room is between men and instructor. It will be gathered from this that the man needed must be one of many parts, and a paragon in special knowledge, in capacity for imparting it, and in his instructing conduct. In short, the specification for the gas-fitters' instructor is a very comprehensive one. But supposing such men were to be found, supposing gifted young men qualified themselves for the position of instructors to a number of gas undertakings in districts under a co-operative scheme of the kind suggested, would the gas undertakings concerned compensate them adequately, so as to induce them to put their hearts and souls into the work of making the outdoor artizans well-instructed and capable working representatives of a progressive trading industry?

Gas-Engine and Electric Motor Failures.

Is it too much to ask Mr. Michael Longridge, the Chief Engineer of the British Engine, Boiler, and Electrical Insurance Company, Limited, if it would be possible for him to discriminate between the various engines that he at

present aggregates in the table in his annual report (the subject of an article elsewhere in this issue), dealing with breakdowns of gas and oil engines? We should, as we have said before, like to see a division made between gas and oil engines; and we should doubtless find it instructive to have the gas-engines subdivided between those using town gas and suction or other producer gas. Mr. Longridge prides himself, and rightly, on the Company with which he is associated being something more than mere collectors of premiums and payers of claims. By the employment of competent engineering inspectors, they also protect and serve economic and scientific ends. On this higher platform than the purely financial, we base our suggestion to the discrimination of engines as suggested, as we believe there would result much interest.

The table in the report before us supplies us with very good argument in support of the request. Most of the figures referring to the breakdowns of engine parts in 1910 exhibit a diminution compared with those for the prior periods given in the preceding columns of the table. This gratifying state of things may be ascribed to several causes. In replacing rule-of-thumb by calculations based on the law of applied mechanics, the Universities and Technical Colleges may take some credit for the improved tale; but we opine that much is due to the experience of failures, and to the intensified study for some years past of the problems clustering about the internal combustion engine. The extraordinary reduction shown in the breakdowns of cylinder and cylinder ends is a pleasing illustration of constructional advance. But the remarkable increase in the breakdowns of valves and valve gear is an argument for the separation of the gas and oil engines, and the further sub-classification of the gas-engines as between those employing town gas and those using suction and other producer gas. Before 1904, valves and valve gear figured among the breakdowns for an average percentage of 30·1; but the average since then—the period of the suction-gas producer—has risen. For the years 1904-8, the average percentage was 33·3; in 1909, the percentage (29·6) was a little below the average of the preceding five years; but last year, it was as high as 42·8. There must be some cause for these higher figures in recent years in connection with valves and valve gear. We know what trouble suction gas and its cognates have produced in the valvular parts of engines; and if here we touch the cause for the higher figures found in the record, then we should much like town gas to be relieved of any semblance of responsibility by the splitting-up of the present grouping.

It is remarked that, in the gas-producer plants themselves, the percentage of breakdowns decreased from 11·4 in 1909 to 8·5 in 1910. Between year and year there are bound to be variations; but it will be noticed that the failures in the producers are given as percentages among the breakdowns applying to the engines. This is hardly fair to the engines that do not use producers. But it does indicate to the manufacturer using power that the gas-producer introduces an additional source of breakdown and stoppage quite apart from the engine, and that the engine itself (if we are right in our surmise as to the valve and valve gear breakdowns) is more liable to stoppage through the suction or other producer gas than when an engine is fed with the purer gas supplied from the street mains. If the percentage of stoppages in the gas-producers is on the decline, it may be due to the fact that the users are giving them the greater attention that experience has pronounced to be necessary, but which the salesmen of such plant at one time of day (if they do not do so now) said was not required. There is also the gradual disestablishment of suction-gas plants, through the weeding-out of those that have given trouble and annoyance to their users, and through the gradual reflux to the town-gas main, as illustrated the other day by Mr. R. J. Rogers, of the Birmingham Gas Sales Department, in his address to the Midland Junior Association [*ante*, p. 184].

One more lesson from the report. The breakdowns of gas-engines (town gas and suction gas driven) were in the proportion of 1 in 10·8 insured, while continuous current electric motors (which represent 83·5 of the whole) broke down in the proportion of 1 in 8 insured, and alternating-current motors 1 in 12. It will be seen from these figures that, contrary to the representations of electrical literature, the liability to stoppage is greater with electric motors than with gas-engines, notwithstanding the higher average age of the latter. There is the further contingency against the electric motor of cessations in the supply of the current. Not only is there a disinclination of the electric motor to show improvement in regard to breakdowns, but the percentage cost incurred in dealing with failures has a tendency to ascend. In these figures and experiences, there is a complete answer to the alleged greater reliability of the electric drive.

Improved Coal-Supply Arrangements at Nice.

In another column will be found the translation of portions of an article which appeared a short time ago in the "Génie Civil," giving a description of the new arrangements which have been made for ensuring the supply of coal to the Nice Gas-Works. The coal arrives by sea from England; and it was formerly conveyed from the ships to the gas-works by horses and carts, and stored by manual labour. Various inconveniences attended this system, not the least being the unreliability of labour. As the result, however, of the combined efforts of the Gas Company, the Tramways Company, and the local Chamber of Commerce, mechanical plant has been introduced which not only ensures the supply of coal, but does it at less cost than before—at 8¾d., compared with 15½d. per metric ton. A feature of the new arrangements is a coal-waggon designed by the Engineer of the Tramways Company (M. Birlé), who contributed to our French contemporary the article already referred to, and who courteously placed at our disposal the photographs with which the particulars given elsewhere are illustrated. This waggon greatly facilitates the delivery and storage of the coal. The installation is interesting from the fact that a Tramways Company were in a position to undertake the work of unshipping coal and conveying it into gas-works.

The Outlook for Gas Stocks.

The merits of gas stocks in general as an investment are well known to "JOURNAL" readers; but, among the many outlets for capital—and particularly in these times, when foreign securities of different kinds seem to be so largely favoured—some sections of the public may overlook the claims of the industry to consideration. It is gratifying, therefore, to see an article such as Mr. G. M. Gill has contributed to the current issue of the "Investor's Chronicle," drawing attention to the outlook for gas companies, which, it is remarked, may be described as distinctly good. Attention is drawn to the facts that, even if the future is not entirely clear of clouds, there is yet every prospect of the present prosperous condition of the companies being well maintained; that during the last two or three years excellent progress has been made throughout the whole gas industry; and that nearly all the London and Suburban Gas Companies have both reduced their price of gas and increased their dividends. In explanation of the cause of the prosperity which is manifested, Mr. Gill points out that the production of gas per ton of coal has been recently largely increased; the cost of production has been reduced in the important item of wages; the quality or quantity of the residuals—coke, ammonia, and tar—yielded has been much improved by new methods of working, while they have also realized favourable prices; and the figures relating to the growing consumption of gas are satisfactory—the increase experienced being largely due to the extending use of gas for cooking-stoves, fires, and hot-water systems in houses. Taking everything into consideration, the author is of opinion (and it is a sound view) that, though the unrest among miners is a factor which cannot be disregarded, there are so many points acting in favour of continued prosperity that the future may be anticipated with cheerful confidence. The practical utility of the article to the investor is increased by the inclusion of a short list of promising gas stocks which have been selected by Mr. Gill for the reason that in each case there are good prospects of reduced prices for gas and consequent increased dividends in the future; that the undertakings named are large enough to have a reasonable market; and that, while sound financially, they give a good yield upon investment.

The Law of Picketing.

In a memorial which is so influentially signed that it should command the most serious consideration of the Government, the Employers' Parliamentary Council have drawn the attention of the Prime Minister to the grave evils which have arisen in consequence of the Trade Disputes Act, 1906, and to "the present combination of labour unions for the purpose of promoting national

strikes fraught with incalculable loss and immense suffering to the community." In view of recent experiences of picketing, the memorialists (among whom, it may be remarked, are included the Gas Companies' Protection Association and the South Metropolitan Gas Company) make the following suggestions, which do not appear anything more than employers, workers, and the general public are fairly entitled to for their proper protection: (1) That picketing should either be rigorously suppressed or the number of pickets should be limited to two, and such pickets should be required to wear a distinguishing badge, and attend only where a person works or carries on business. (2) That unions, whether of workmen or masters, should be subjected to the ordinary law of the land and made responsible, like all other classes of the community, for their actions. (3) That a federation of unions for the purpose of "paralyzing the country" by means of a general strike or lock-out, throwing all industries and communications into disorder, and stopping the food supplies of the nation, should be suppressed as an unlawful combination, and immediately so proclaimed.

Local Government Finance.

Some of the figures contained in Part VIII. of the Annual Local Taxation Returns for the year 1908-9 will be dealt with in a future issue. This particular Blue-Book is the last of the series of returns for that year; and it consists of the summary and index—furnishing particulars with regard to 25,309 separate authorities who had transactions during the twelve months. As is customary, figures are given in the Blue-Book covering a series of years; so that it is possible to make some interesting comparisons. In the period which has elapsed between 1899-1900 and 1908-9, the outstanding loans have gone up from £293,864,224 to £512,487,522. The last-named figure, however, includes a sum of £48,872,063 for the Metropolitan Water Board. The amount provided during 1908-9 (otherwise than out of borrowed moneys) for the repayment of loans was £13,337,494, which was equivalent to about a thirty-eighth part of the total loans outstanding at the commencement of the year. The increase in the outstanding loans (£8,841,906) was smaller than any annual increase between the years 1895-6 and 1908-9. Loans to the extent of £20,649,692 were raised during the year—which sum was smaller by £767,339 than the amount raised in 1907-8, and less than the corresponding amount for any year (except 1906-7) since 1898-9. Of the total loans outstanding, 53¼ per cent. is on account of revenue earning undertakings. The average sum per pound of rateable value of loans outstanding increased from £1 13s. 6d. in 1899-1900 to £2 8s. 2d. in 1908-9; and per head of the population, from £9 4s. 4d. to £14 12s. 4d. The figures for the latter year include the loans accounted for by the Metropolitan Water Board. The average amount per pound of valuation of public rates raised has gone up from 4s. 11·8d. to 6s. 1·19d.; and per head of the population, from £1 5s. 7d. to £1 14s. 11d. In the nine years, the total amount received from rates has risen from £40,734,219 to £61,273,458. Within the same period, the amount of outstanding loans on gas-works has gone up from £19,819,301 to £23,429,647; while that for electric light undertakings has grown from £7,853,061 to £29,357,974. The receipts from gas-works have increased from £6,035,526 to £7,487,871; those from electric light undertakings, from £910,329 to £3,491,040; and those from water-works, from £3,730,219 to £4,909,627. The total receipts have risen from £77,202,175 to £121,952,594. The rateable value of the property assessed to local rates was £175,622,758 in 1899; and in 1909 it was £215,309,542. The National Debt stood at £754,121,309 in 1908-9, as against the £512,487,522 of outstanding loans of local authorities.

Road Board and Binding Road Crusts.

The gas industry is intimately concerned in the proceedings of the Road Board, as the grants that they make and the demand for tar will have a large relationship. The demand for tar for road purposes has been on a good scale this year—so good, in fact, that not many weeks ago a private inquiry through this office for a quantity of tar for export was unsuccessful in securing an immediate contract—through the difficulty of obtaining the quantity required owing to the output, at convenient places, being at the time all placed and in request. That is very satisfactory. Some considerable credit for this is due to the Road Board, whose first report is to hand—covering the period from May 13, 1910, to June 30, 1911. So far, we cannot expect much in the way of data from the Board; and from this report we learn that they have been devoting themselves to determining the lines of their policy at the initial stages of their existence. This initial policy is good for the producers of tar. The motor car brought the Board into being; the motor car and motor spirit combined provide the revenue from which the Board's grants are made. What then could be more natural than that the Board should resolve not to consider the question of the construction of new roads in the first instance, but the improvement of the present ones, and particularly their crusts. "The condition of the road crusts is a most urgent problem. Upon that depends both the alleviation of the intolerable and injurious nuisance arising from mud and dust, and also the mitigation of the burden of increasing cost of maintenance, which is causing such widespread apprehension." The Board favour, and intend to encourage, the use of a bituminous binding material for the crusts and surfaces; and in this connection they hope that the general directions and specifications relating to tar treatment prepared by the Advisory Engineering Committee, and published in April last, will be found useful to local authorities.

Financial Position.

It is perhaps early to say anything very definite about the revenue, and therefore the grant capacity, of the Board; inasmuch as the motor spirit duties and car licence duties were payable and were collected at different periods. However, the total amount credited to the road improvement fund up to July 8 last aggregated £1,161,344, made up as follows: Motor spirit duties for year 1909-10, £290,703, and for the year 1910-11, £410,376; while the motor car licences for 1910-11 brought in £460,265. Between revenue and applications for grants by local authorities there was a wide abyss. The total of the applications was £7,870,459; the revenue, as just mentioned, £1,161,344. What has happened has been that the Board have made grants amounting in the aggregate to £263,324, and loans totalling to £7500. In addition to the grants and loans actually made, grants aggregating £408,000 have been "indicated" to local authorities; the details of the various works towards which these grants are to be made being under consideration and discussion with the local authorities. Out of the actual grant of £263,324, a sum of £208,324 is specially earmarked for the improvement of road crusts; and of the £7500 loans, £7000 is for the same purpose. Bearing in mind the views of the Board as to the use of a bituminous surface binding material, tar producers may look with satisfaction upon the policy and first work of the new authority.

The New Engineer for East Greenwich.

It was only natural that, as recorded in the "JOURNAL" last week, the members of the Midland Junior Gas Association should have passed a resolution, at their meeting on the 14th inst., congratulating Mr. F. J. Bywater, their first President, on his appointment as Station Engineer at the East Greenwich works of the South Metropolitan Gas Company. Reference was made to the able address which he delivered to them; and their congratulations were mingled with a feeling of regret at parting with him. At the same time, they doubtless recognized that their colleague possessed abilities which fully qualified him for the responsible position he had been selected to fill. He has had an excellent preparation for it. He was educated at King Edward VI. High School, Birmingham, where he held a Foundation Scholarship, and became an undergraduate of London University. After leaving school, he studied engineering and chemistry for a year, and was then articled to Mr. Henry Hack, M.Inst.C.E., the late Chief Engineer of the City of Birmingham Gas Department. During his pupilage, and subsequently as Superintendent of Construction to the Gas Department (which post he held for four years), he was concerned with large schemes of construction, including the laying down of complete gas-works at Nechells for 12 million cubic feet per diem, together with gasholders, &c., and the reconstruction of Saltley Gas-Works. In 1905, he was appointed Assistant Works Engineer, and in 1906 was promoted to the post of Works Engineer at the Saltley station; his predecessors in this post having been such well-known Engineers as Mr. S. Y. Shoubridge and Mr. J. W. Morrison. On Mr. Hack's retirement in 1908, he was appointed Engineer of the Saltley works, the capacity of which is 12 million cubic feet per diem. Mr. Bywater was for four years a student of the Institution of Civil Engineers, and subsequently passed the diploma examination and was elected an associate member in April, 1904. The following year he was chosen as the first President of the Midland Junior Gas Association. He joined the Institution of Gas Engineers in 1908, and is now a member of the Council. It will be remembered that at the meeting in the year named he read a paper on "Refractory Material," for which he was awarded the President's silver medal.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 267.)

THE Stock Exchange had a very quiet time last week; business being, apparently, to a large extent arrested pending further progress and development in the many inflammatory points of danger, which extend almost across the Eastern hemisphere in one continuous line from Lisbon to Pekin. It speaks well for the Stock Exchange that it remained calm and collected the while, that prices held up very well, and that some important lines were positively stronger. The opening day gave promise of activity and strength. Government issues were well supported, and Consols rose $\frac{3}{8}$. Rails were firm and advanced. Americans recovered; but Foreign were not bright. Tuesday was quieter and not quite so good; uneasiness as to foreign affairs being irrepressible. But Consols only lost $\frac{1}{8}$; and other of the gilt-edged division were steady. Wednesday began so slowly that prices drooped from inaction; but Continental buying effected a recovery later. Thursday's tone was quite cheerful, and prices rose in many lines. Government issues were firm, and Consols advanced. Rails were mostly, but not uniformly, stronger. Friday was quiet and irregular. The gilt-edged division was well supported, and Consols were a little higher; but Rails were affected by week-end sales. The Foreign Market was better. Business was much reduced on Saturday; but some markets were fairly firm. Consols were strong and closed at 78 to 78¼—a rise of $\frac{3}{8}$ in the week. Rails were rather pleased by the report of the Commission, but were careful not to make too much of it. The Money Market continued in a state of excessive ease, and rates were much relaxed. Business in the Gas Market was pretty fair in point of volume, and everything dealt in was quite firm. Changes of quotation were not numerous, but were uniformly upward, and some of them were unusually large. In Gaslight and Coke issues, the ordinary was steady and unchanged—transactions ranging from 104¼ free to 105¼. In the secured issues, the maximum realized from 85¼ to 86, the preference from 103 to 103¾, and the debenture from 80¾ to 81½. South Metropolitan was inclined to be a shade easier at 116½ to 116¾. The debenture made 80½. In Commercials, the 4 per cent. was done at 110½ and 111½, and the 3½ per cent. at 106½. Among the Suburban and Provincial group, Alliance and Dublin changed hands at 80½ and 81½, British at from 44¾ to 45⅜, Southampton at 109½, and South Suburban at 119½. In the Continental companies, Imperial was done at 183½ to 185 (a rise of 1), and European at 19 to 19½. Union, which was dealt in at 82, rose sharply till it marked 90½ on Friday. The quotation now rose 9, having fallen 5 the week before, which is remarkable. Among the undertakings of the remoter world, Cape Town debenture was done at 80 free, Melbourne 4½ per cent. at 100½, Monte Video at 12⅞, Oriental at 139¼ and 139¾, Primitiva at from 7⅜ to 7½, ditto preference at 5¼ and 5 1/16, San Paulo at 10¾ and 10⅞, ditto preference at 12 3/16, and ditto debenture at 50½.

ELECTRICITY SUPPLY MEMORANDA.

Testing Efficiencies—Efficiencies, Costs, and Hiring and Wiring—The Greatest Lesson of Olympia—Electric Motor Collapses—Consumers' "Faults"—Goody's Predictions and Innuendo.

THERE is a desire to ascertain something definite from our electrical friends, so that a common course of procedure, if scientifically acceptable, can be followed. It has to do with the gas and electric cooker efficiency tests. There has been much said by those of fervent electrical belief as to gas and electrical cooker efficiencies; but we have never yet been able to get a description of the cookers that, it is suggested, have been brought into contrast. That is the first information we should like to have. But the more important point is, if any actual scientific tests have been made of electric and gas ovens, that we should like (and should be greatly obliged by compliance) to have explained the method of procedure adopted, in order that we may arrive at a common standard. Means can, of course, be suggested for making comparative efficiency tests of gas and electric ovens, though such tests would only be comparative, and would not represent the actual temperature efficiency, or give any proper account of the total heat units introduced into the oven by the gas or the electricity. There is also the method of testing the radiated heat, and the losses due to flues, to means of ventilation, and to other points of heat escape, and then to take the balance as being heat usefully employed in the oven—so arriving at the heat efficiency. We hope our electrical contemporaries, in the interests of scientific investigation, will try to prevail upon those electricians who, we take it, have made scientific tests to support their declarations on the subject of heat efficiency, to say how it was done, in order that we may not be working on different lines and levels, and so be arriving at different results, and thus possibly be deceiving ourselves and others.

On this question of the domestic utilization of the heat of electricity for domestic purposes, our electrical friends are falling into stereotyped argument, and are running themselves into the making of some absurd statements either off their own bats, or by quoting the assertions of others—among the others, Professor Fleming. Let us give an example. The "Electrician" refers to a unit of electricity, or a kilowatt-hour, as representing 3440 B.Th.U., and to a cubic foot of gas (say) 600 B.Th.U. We will take these figures as the basis of argument. Later on in the same article, we have the statement: "A gas-ring and kettle usually have an efficiency of 50 to 60 per cent., as against 90 per cent. in the case of the electric kettle, and thus electric utensils are able to compete with the gas-ring *in regard to cost*." Now for the sake of argument let us assume an electric kettle using a unit of electricity per hour and costing 1d., and it has 90 per cent. efficiency. This efficiency would be equivalent to the useful service of 3096 B.Th.U. of the 3440 alluded to by our contemporary. Now take a gas-ring and kettle for the same work, and giving a 60 per cent. efficiency, it is easily calculable, on the figures quoted from our contemporary, that 8½ cubic feet of gas of 600 B.Th.U. per foot (total 5100 B.Th.U.) would suffice—this representing the consumption of about ¼d. worth of gas at 2s. 6d. per 1000 cubic feet. A 60 per cent. efficiency would be equal to 3060 B.Th.U. Do our friends really know what they are talking about? The statements quoted above rather cause us to doubt. On top of all the talk there has been about electric cooking and heating being more economical than gas, and such silly statements as that, if gas were given away, it would even then be cheaper to use and pay for electricity for cooking, we find the more sober-minded electricians are looking at other considerations. It is thought by some of them that there must be facilities for hiring the appliances if any headway is to be made, and others point to the fact that there are few private lighting systems that will stand cookers and heaters being used upon them. The necessity, too, for the supply of electricity at power rates, so as to get people even to give a passing look at heating and cooking by electricity, means a separate system of wiring, or, as an alternative, supposing the present wiring would suffice, the adoption of the "telephone," "Norwich," or some such system of charging.

Discontent among those who had to pay the piper for the Exhibition at Olympia grew as the days lessened during which the exhibition had to remain open, until last Saturday, when it closed, there were not a few among the exhibitors who were glad it was all over, and that their release had come. In the aggregate, there have been a good many people there, but not the numbers that were anticipated, nor the people who were most wanted. The money has been mainly spent in showing the electrically educated what they already knew. To the onlooker, it has been interesting, but not edifying, to notice the way accusations of mismanagement have been hurled about. One way in which Mr. Justus Eck, of the Union Electric Company, Limited, thinks that things were bungled was in having the exterior of Olympia dull and unattractive. He considered the external display was "paltry" and ludicrously insignificant. In consequence, he offered, on Oct. 5, eight or more "Excello" intense flame arc lamps for lighting the front, provided they were immediately put up for use, properly trimmed, and regularly used after dark, during at least the last two weeks of the exhibition. But the Editors of the "Electrical Review" let the "cat out of the bag" when they said: "We believe we are correct in stating that, while better external lighting would be desirable, it is impossible to obtain the necessary supply of electricity for that purpose." But why did not the electrical authorities apply to the gas company? We are confident that they would not have hesitated in sending along a small compressor and high-pressure lamps, and in a very few hours would have helped the electrical people over the stile with a few 4500-candle power units for the lighting of the front of Olympia. Mr. Justus Eck does the gas industry an injustice when he said in one of his letters of the 5th inst.: "The gas industry are doubtless already laughing at the inadequate lighting, and satisfying shopkeepers and factory owners of the inferiority of all electric lamps to the modern high-power gas unit." The gas industry possesses sympathy, as well as business attributes, supplemented by humour. There is another point over which we think Mr. Justus Eck erred. A comparatively small section of London would have seen the front of Olympia—whether magnificently or poorly illuminated. The attractions to Olympia wanted to be laid farther afield than the front of the building itself. But now—too late! That is the greatest lesson of Olympia.

In the report of the Chief Engineer of the British Engine, Boiler, and Electrical Insurance Company, Limited (Mr. Michael Longridge), information is given regarding the electrical business, the percentage increase of which, if we read the following figures correctly, is of a somewhat lower order than the percentage cost of dealing with the breakdowns of electrical machinery:

Increase in Business during 1910, *compared with* 1909.

	Dynamos.	Motors.	Starters and Controllers.	Totals.
Machines insured (increase per cent.)	6·2	12·5	17·6	14·0
Breakdowns	22·4	11·2	16·0	12·8
Cost	35·2	15·2	10·2	17·6

When we contrast the figure as to cost with those for machines insured and for breakdowns, the tendency does not appear to be so good, from the financial point of view of the Company, as they could desire. As to the rates of breakdown in the various classes of machine, they were as follows: Dynamos, continuous current, 1 in 16·5; alternating current, 1 in 5·3. Motors, continuous current, 1 in 8; alternating current, 1 in 12. Starters and controllers, 1 in 25·4. The figures as to motors are the ones of most interest to us; and they belie the statements electrically made as to the greater reliability of the electric motor than the gas-engine. Here we have of the motors insured in this Company on continuous

current 1 in 8 breaking down in the course of the year, and on alternating current 1 in 12, *plus* which, of course, are the stoppages occasioned by interruptions of the energy. In the case of gas and oil engines (we get the classes a bit mixed in this connection), the failures of the year are in the proportion of 1 to 10·8; and looking at the accounts of the accidents in the report, some of the gas-engines that broke down were patriarchal characters, while the electrical motors should be, in comparison, juveniles in years. Furthermore when considering the proportion of 1 breakdown to 8 motors on continuous current, it is interesting to note than no less than 83·5 per cent. of the insured motors are on continuous current, and only 16·5 per cent. are on alternating current—the latter figure having gradually grown from 3·5 per cent. in the past decade.

The causes of the year's breakdowns of motors are tabulated as follows:

Cause of Damage.	Average for Eight Years Previous to 1909.	1909.	1910.
Accident . . . . . per cent.	7·9	2	5
Dirt and neglect . . . ,,	21·9	26	24
Age and deterioration . ,,	22·8	14	18
Bad work or design . . ,,	15·4	14	16
Overloading . . . . ,,	4·5	1	1
Unascertained . . . ,,	27·5	43	36

The unascertained causes of failure (the numbers referring to which are heavy) are characteristic of electricity.

There is an article in an electrical contemporary on consumers' faults. Of course, consumers have many faults—one of which is to blame gas and electricity suppliers for any troubles from which they suffer in connection with the service. The "faults," however, referred to in the article in question allude to installation faults. The opening paragraph says: "A great difficulty with which a mainsman has to deal is that of small 'earths' which occur from time to time on consumers' installations. These are first noticed by the recording ammeter in the earth circuit, and remain on for just a few hours in the evening. Now, the difficulty arises in locating these. It may be done in the case of a three-wire system by putting the opposite pole to that which the earth is on to earth potential, and thus trying to break the fault down; but this is a dangerous practice, especially during the hours of load, for it may break down other installations which are not quite up to standard, and cause, as in cases known, a fire, or public buildings to be plunged into darkness, besides which it is a most clumsy method, and one which would not appeal to the engineering side of the mainsman." If this paragraph were read with proper emphasis to a householder (who is not an expert in electricity matters), when he is considering the question of having a change from gas to electricity for lighting, it would, we think, be just about all he would require to turn the balance in favour of sticking to gas, and bringing his fittings up to modern notions of what they should be.

If anyone has anything very highly flavoured to say about gas, send it to the "Electrical Review." Mr. H. E. Goody has written an article that contains rather a large proportion of innuendo concerning the gas industry, and says much that is absurd concerning the approaching demise of the still growing, and consequently much hated, industry. We cannot account for a serious technical paper giving space to such folly as we find in the article. The writer says that "the *end* is approaching; and gas has very nearly had its day—or should we say, its night?" Mr. Goody thinks the proof of this is to be found in the advertising activity of the gas industry—in fact, "gas companies are rapidly losing ground to the electricity supply companies who practically do no advertising at all." Mr. Goody appears to be somewhat at fault in logical and consecutive thought; for in the final paragraph of his article he suggests that a vigorously conducted campaign would do a tremendous lot of good for the electrical industry." Why expend money and energy when the gas industry is rapidly losing ground to the electricity supply companies, and the "end" is approaching? That would be absolute waste. But earlier in the article, we see too that the "sly attacks" on electricity in the daily press are "simply one phase of the losing battle which the gas interests are waging against the electrical industry." And proceeding a little farther, we learn that "one likely explanation of this singularly unscrupulous journalism is that the reporters who 'write-up' fires are influenced by the gas interests. All the available evidence gives good ground for the surmise. And, of course, it does not *necessarily* mean that the reporters are given direct cash payments for their service in this connection." It may be that this is "the newspapers' method of gratefully and definitely recognizing the generosity of the gas companies in the distribution of advertising contracts." We confess to difficulty in finding the proper expressions to apply to such stupid innuendo and prophecy, and to the wasting of the space of a technical paper in publishing it. Of course, people can please themselves as to the extent that they properly portray themselves in the eyes of the world; and writers and editors may likewise please themselves as to the frequency of the times that they array themselves in white, and, with eyes uplifted, thank goodness that they are not as other men.

PERSONAL.

Mr. Robert West, who has served his apprenticeship at the Hebden Bridge Gas-Works under Mr. E. J. Wellens, has been appointed Manager of the Hollingworth Gas-Works, near Glossop.

Mr. S. Tagg, Engineer and Manager of the Preston Gas Company, was married on Thursday last at Lytham Parish Church, to Miss Edith Anderson Kidney, eldest daughter of Mr. Andrew Kidney, of "Abbotsford," Lytham.

Mr. J. O. Halliwell, Manager of the Milnthorpe Gas Company, has been appointed Manager of the gas-works at Mullingar; and the Directors have appointed Mr. Thomas Dawson, of the Carnforth Gas-Works, to succeed him.

Mr. A. Clifford Swales, Engineering Assistant to the City Engineer of Leeds, has been appointed Secretary of the Junior Institution of Engineers, in succession to Mr. Walter T. Dunn, who a short time ago relinquished the position.

At the opening of the fifty-sixth discussion session of the Manchester Association of Engineers, Mr. H. A. Humphrey, of London, was presented with the "Constantine" gold medal for his paper last session on "Humphrey Pumps and Compressors."

Among the new Justices of the Peace who have lately been appointed for the county of Kent we notice the names of Mr. Corbet Woodall, for the Bromley Division, and Mr. Henry Woodall and Mr. R. Ludwig Mond, for the Sevenoaks Division.

OBITUARY.

Though the name of Mr. John Malcolm Forbes Ludlow may not be known to a great many of the readers of the "Journal," his death last Tuesday, in his 91st year, calls for brief notice in these columns from the fact that he was one of the pioneers of the co-operative movement in 1848. The first attempt to form a workmen's productive co-operative society was a failure, but a second was made, and the successful modern organization is the result. Mr. Ludlow was the prime mover in the first Co-operative Congress, held at the Society of Arts in 1869, and was the Editor of its "Proceedings." In 1870, the Government appointed a Royal Commission on Friendly and Benefit Building Societies, with Mr. Ludlow as Secretary; and the Act of Parliament which followed is the Charter of the co-operative and co-partnership societies. When the Labour Co-partnership Association was started in 1884, he was one of its first members. In 1897 he became its President; since 1898 he had been its honorary legal adviser; and he represented the Association at the first International Co-operative Congress. It is scarcely necessary to say that Mr. Ludlow was a firm believer in industrial co-partnership; and according to the notice of his life-work which appeared in "The Times" last Thursday, to which we are indebted for the preceding particulars, it was stated that almost his last act was to sign a manifesto urging the wider adoption of the system as a remedy for the present Labour unrest.

GAS ACTS FOR 1911.

[Second Article.]

The Statutory Gas Companies who were in Parliament in the present session have all succeeded with their Bills, though, as will be seen by the review, the measures have been, in cases, subject to some modification before receiving the Royal Assent.

In the case of the Chichester Gas Company, the extension of the limits of supply sought has been granted; and in their extended limits the Company are authorized to charge for gas a price not exceeding by 6d. per 1000 cubic feet that charged within the limits as defined by their Act of 1868. The additional capital powers required—£20,000 "C" stock—have been granted, together with one-third borrowing powers. Up to £10,000 of the additional capital may be raised as preference; and on this a higher dividend than 6 per cent. is not to be paid. Protection in regard to the laying of pipes in the roadways is given to the County Council of West Sussex; and the London, Brighton, and South Coast Railway Company likewise have obtained protection for such interests as the Company's operations may threaten. The "Metropolitan" No. 2 burner is to be applied to the testing of gas, the standard of which is 14 candles. The Company originally asked for portions of the district in which the Petersfield Gas Company have not exercised their powers to be included within their own area, and the rights of the Petersfield Company cancelled. The clause does not appear in the Act. [*Parliamentary Agents: Messrs. Blyth, Dutton, Hartley, and Blyth.*]

The Enfield Gas Company have been empowered to purchase by agreement additional scheduled lands, and the confirmation of purchase already made of part is granted. Upon land described in the first schedule of the Act, the Company may construct new works. Additional capital to the amount of £100,000 is authorized, with one-third borrowing powers. Permission is accorded to the issue, under the co-partnership rules, to employees of such amount of stock as may be specified by the trustees without first offering it for sale by auction or tender. Power is given to substitute or redeem the 5 per cent. debenture stock created and issued under the Order of 1879. Authority to form a special purposes fund is

included. The clause, however, as to the institution of a capital redemption fund has been erased; and the prepayment meter clause has assumed in all respects the model form. There was a variation which was noted when dealing with the Bill on Jan. 10 last (p. 88). The old discounts clause has disappeared; but the stand-by clause has been allowed. The suggested new clause as to the exemption for liability to damages through the non-repair of meters, fittings, &c., let by the Company on hire unless notice in writing had been given, and there had been neglect to do the work within reasonable time, has not gone through. On terms for which there is ample precedent, power-gas supply authorization is conceded. It will be remembered that the Company made a stiff fight against the Middlesex County Council in the matter of pipe-laying work, and defeated the onerous conditions the Council sought to impose. The Council did obtain certain protection, but much in the now ordinary terms. Where reasonably possible when pipe work is in future being carried out by the Company, there is to be a depth of 2 ft. 6 in. between the road surface and the upper surface of the pipes. There is also a series of clauses relating to the disposal of the stock and deposits of any co-partners on death. [*Parliamentary Agents: Messrs. Rees and Freres.*]

In referring to the Act of the Gaslight and Coke Company, in which Parliament has confirmed the scheme for the transference of the Barking and Chigwell Gas Companies' undertakings to the premier Company, it is unnecessary to repeat the financial history and terms on which the transfers are to be effected, as the particulars were set out so fully in the "JOURNAL" for Jan. 10 last (p. 89). Provision is made as to the payment of dividends to the shareholders of the two Companies to December next; the transfers taking place on the 1st of January. The special purposes fund is varied from the model by the appropriation of an amount equal to ½ per cent. (instead of 1 per cent.) of the paid-up capital, and by the maximum amount standing to the credit of the fund not exceeding one-twentieth part of the paid-up capital, instead of one-tenth part. The Directors take power to determine the salary of the Secretary; and authority is given to fix the remuneration of the Auditors at a sum not exceeding £600. This was the foremost and perhaps the heaviest gas measure of the session; but there is not another that has been altered less. Therefore in all respects reference can with confidence be made to the sketch of the provisions of the Bill to which allusion has already been made in this paragraph. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Luton Gas Company have secured the land powers sought for manufacturing purposes; and they have also been entrusted with the desired additional capital authorization—£100,000, of which not more than £66,000 is to be raised as preference. The dividend on this new capital is not to exceed 5 per cent.; and the sliding-scale dividend terms are, in consequence, reduced to the 2s. 6d. scale, in place of 5s. The money spent by the Company out of revenue on capital account, and amounting in the whole to the sum of £90,571 16s. 7d., is to form a separate class of capital, to be described "E," and is not to be considered as part of the capital entitled to dividend. The provisions of the Companies Clauses Consolidation Act, 1845, with respect to the conversion of borrowed money into capital, are to cease to apply to the Company. The power to convert is therefore removed. The Company are given the right to borrow in respect of the capital created by their Acts of 1858 and 1890, and the present one, any sums not exceeding (inclusive of £12,200 already borrowed) £51,853; and, as to the new additional capital, one-third part. The carry-forward is limited to the amount required to pay one year's dividend at the authorized rate, or the sum of £12,000 whichever is the greater amount. Tested by the "Metropolitan" No. 2 burner, the standard quality of the gas is to be 14 candles. A stand-by clause, in respect of private gas plant, is allowed. Protecting clauses have been granted to the Midland and Great Northern Railway Companies and to the Luton Corporation. In the case of the Corporation the clauses chiefly refer to the notices to be given; but there is also exemption in regard to liability for injury from the ordinary use of a steam or other roller not exceeding 15 tons in weight. [*Parliamentary Agents: Messrs. Lees and Co.*]

The measure promoted by the Swansea Gas Company, it will be remembered, was the subject of considerable discussion before Committees during the session, in consequence of the opposition of the Corporation. The Act shows the effects of the agreements and decisions. There has been a partial modification of the land powers required for manufacturing purposes. The piece of land scheduled for this purpose measures 2 acres 3 roods. The use of the much-discussed piece of land, known as the Vetch Field, is limited to the storage of gas and residual products. There is a reservation in respect of the land powers in favour of the Corporation, whereby, under specified conditions, the Corporation may have a strip of the scheduled lands for road-widening purposes. Messrs. Powlesland and Mason are in occupation of part of the land; and they are protected in regard to the method of ascertaining the sum to be paid to them for their premises, and in respect of retaining possession for a period of twelve months from the date upon which there shall have been service of notice to treat by the Company for the purchase. Permissive powers are also given the Company to purchase by agreement lands not exceeding in the whole 15 acres. The necessary powers relating to works construction have been granted. The Company's capital powers are extended to the amount originally requested—£200,000. The borrowing powers sought have also been agreed to—viz., an additional £22,500 in respect of the existing capital authorized by Acts and Orders (being the difference between one-third and one-fourth of the capital thereby authorized), and up to one-third part in respect of the additional capital allowed by this Act. The dividend on the ordinary additional capital is limited to 5 per cent., and on the preference capital to 4 per cent. In connection with the conveying of excess profits to the divisible balance, it is provided that, whenever the sum standing to the credit of divisible profits shall exceed a sum equal to the amount required for a year's dividend on the share capital, the balance shall be applied first to filling up the reserve fund, and any balance remaining is to be devoted to the reduction of the price of gas. Within two years after the passing of the Act, the Company are to invest their reserve fund in accordance with section 31 of the Gas-Works Clauses Act. The proposed powers for putting in force a profit-sharing scheme for the employees have been confirmed; and so has the stand-by clause (reproduced in our issue of Jan. 10), with the inclusion of the italicized words in the following opening lines:

> Where any person has, for the purposes of a stand-by only, a supply of gas laid on by the Company to any premises for which he has at the same time a separate supply of electricity or gas for power or other purposes (*not being domestic purposes*), the Company shall——

The clause (as printed in our issue of Jan. 10) referring to the provision and working of private installations has been modified; and so we reproduce it to show the changes and additions made:

> The Company may, at the request of the owner or occupier of any premises within the limits of supply, which cannot conveniently, or without undue expense, be supplied from any existing main for the supply of gas from their authorized gas-works, provide and fix upon such premises, upon and subject to such terms and conditions as to payment and otherwise as may be agreed between the Company and such owner or occupier, stoves, ranges, pipes, fittings, and appliances, necessary or convenient for the purposes of the generation, supply, use, or consumption upon such premises of acetylene, gasolene, or suction gas, or any other gas, and may enter into and carry into effect contracts or agreements with any such owner or occupier as aforesaid for the working and use of any engines, motors, dynamos, generating, and other apparatus: Provided that the Company shall not, without the consent of the Corporation, supply gas under the provisions of this or the next following section except temporarily, and pending the laying down of a main from which the premises can be conveniently supplied with gas from the Company's authorized gas-works: Provided also that nothing in this section shall exempt the Company from any indictment, action, or other proceeding for nuisance in the event of any nuisance being caused or permitted by them upon any such premises as aforesaid.

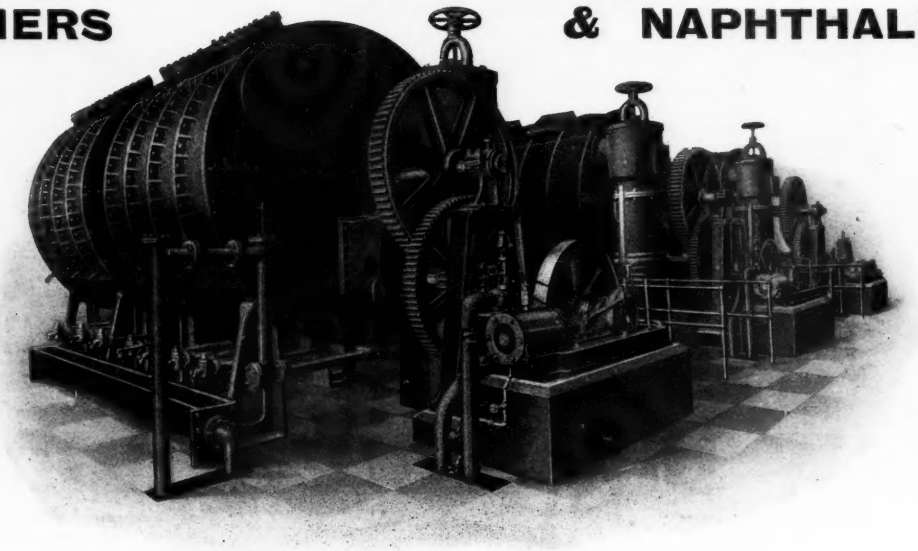
The provision as to the temporary exercise of the powers otherwise than without the consent of the Corporation will be noted. The ordinary conditions are applied to the supply of power gas by the Company. They are further relieved of the obligation to give from any main a supply of gas for any purpose other than lighting or domestic use in any case where the capacity of the main is insufficient for such purpose, or if, and so long as, any such supply would, in their opinion, interfere with the sufficiency of the gas required to be supplied by means of such main for lighting purposes. The Harcourt 10-candle pentane lamp has now been prescribed as the standard lamp to be used for testing. The London and North-Western Railway Company are allowed protecting powers; and the streets and roads belonging to the Great Western, Midland, Rhondda and Swansea Bay Railway Companies and the Swansea Harbour Trustees are also protected. [*Parliamentary Agents: Messrs. R. W. Cooper and Sons.*]

The Tamworth Gas Company have been empowered to extend their limits of supply to Shuttington and Polesworth. Authority is also given them to use 4½ acres of land now in their possession for the construction of new manufacturing works. They may raise £15,000 of additional capital, half of which may be in the form of preference shares or stock. Borrowing powers to the extent of one-third are accorded. The dividend on the additional capital is limited to 7 per cent., and, on preference capital, it is not to exceed 6 per cent. A 14-candle standard illuminating power is now prescribed, tested by the "Metropolitan" No. 2 burner. The price of gas is not to exceed 5s. per 1000 cubic feet, but outside the borough a price up to 8d. in excess of the Tamworth figure may be charged, providing it does not cause the price to be in excess of the maximum of 5s. Stand-by clauses are allowed in respect both of private gas installations and electricity supply; and the Company are exempt from penalty for refusing to give a supply where suction gas is used, if such supply would interfere with, or jeopardize, the supply for public or private lighting. Any dispute in this connection may be referred to arbitration. The clauses protecting the Staffordshire and the Warwickshire County Councils are of an order that is getting common, and not of the onerous kind that the Councils, it will be within recollection, tried to inflict. In laying cast-iron pipes in main roads in future a depth of 2 ft. 6 in. is to intervene between the surface of the road and the upper surface of the pipes, and 2 feet for steel pipes. [*Parliamentary Agents: Messrs. Baker and Co.*]

The request of the Weston-super-Mare Gas Company for power to raise an additional £80,000 of capital has been curtailed to £55,000, the dividend upon which is not to exceed, in the case of either preference or ordinary capital, 5 per cent. In respect of the capital already raised, the Company are authorized to borrow (inclusive of £14,500 already borrowed by them) one-third of the nominal amount—the same proportion applying to the unissued existing and additional capital powers. Authorization is given as to the maintenance and construction of works. [*Parliamentary Agents: Messrs. Blyth, Dutton, Hartley, and Blyth.*]

EFFICIENT WASHING PLANT.

HOLMES' WASHERS FOR AMMONIA & NAPHTHALENE.



An Installation at a Colonial Gas-Works—including Two Repeat Orders.

TOTAL CAPACITY, 7,500,000 Cub. Ft. per Day.

W. C. HOLMES & CO., LTD., *Sole Makers,* **HUDDERSFIELD.**

GAS COOKERS AND PARTS

ENAMELLED CROWN PLATES AND LININGS.

A GAS ENGINEER WRITES: *"Your Gas Stove Burners and Deflectors have more than double the life of those supplied us by other Makers."*

We can make your Stove Department show a big increase in profit.

Send us Trial Order for:—Burners and Deflectors, with Samples.

Telegrams: "AMOUR, LONDON."
Telephone Nos.: 1890 HOLBORN CENTRAL 194.

A. G. CLOAKE,
54, HOLBORN VIADUCT, LONDON, E.C.

ECONOMICAL GAS APPARATUS CONSTRUCTION Co., Ld.

Merrifield Westcott Pearson

WATER GAS PLANTS

19, ABINGDON STREET, WESTMINSTER, S.W.

Telephone: VICTORIA 39.
Telegrams: "CARBURETED, LONDON."

Davis's

The "APOLLO"
(In 3 Sizes).

The "ROYAL."

The "VESTA"
(In 3 Sizes).

New Barless Gas Fires

Chapter 7.

THE CANOPY
and the problem of the
SLUGGISH CHIMNEY

MANY a consumer has a deep-rooted prejudice against Gas Fires in general because he, in particular, has been unfortunate enough to suffer from by-passing of products owing to the sluggish-chimney trouble.

Our "NEW BARLESS" FIRES cure the prejudice because they remove its cause. The canopy of every fire in the series has been SPECIALLY DESIGNED ON SCIENTIFIC LINES TO PREVENT BY-PASSING where a sluggish chimney has to be reckoned with.

The Davis Gas Stove Company, Ltd.
LUTON.

SHOWROOMS

LONDON - - - 59, Queen Victoria Street, E.C.
MANCHESTER - 4, Victoria Arcade, Deansgate.
PARIS - - - - - - 82, Rue d'Hauteville.

THE QUALITY OF LONDON GAS.

Third Quarter of the Year.

THE results of the official testings made in the testing-places controlled by the London County Council during the third quarter of this year are, in accordance with our usual practice, summarized in the following tables. The "quarter" referred to is the period of thirteen weeks ended Sept. 30 last. [The similar results for the first and second quarters of the year were given in the "JOURNAL" for May 23, p. 511, and Aug. 29, p. 534.] The figures for the corresponding quarter of the two preceding years are included in the tables for the sake of comparison.

Illuminating Power.

Table I. shows the averages of the results of all the testings of illuminating power during the third quarter. In regard to the testings made with the No. 2 "Metropolitan" argand burner, there is a slight lowering of the average value of the gas both as compared with the corresponding quarter of last year and the second quarter of this year, when, however, the results were higher than in the first quarter of the year. The minimum results of the testings made with the argand burner in the third quarter were: For the Gaslight and Coke Company, 13·16 candles; for the South Metropolitan Company, 14·01 candles; and for the Commercial Company, 14·02 candles. The result of 13·16 candles reported for the Gaslight and Coke Company would render the Company liable to incur a forfeiture in respect of deficiency of illuminating power if the mean of this result and the results on the preceding and following days at the same testing-place should be below 13½ candles. But the weekly returns and summaries of the results of testings issued by the London County Council do not give sufficient details to show whether the minimum of 13½ candles on the average of three days' testings was passed in this case. There has been no question during the quarter of either the South Metropolitan or the Commercial Company supplying gas deficient in illuminating power according to the standard laid down in the London Gas Acts. The flat-flame testings are now made at rarer intervals than in former years, and are of very little interest. The minimum results of the flat-flame testings were: For the Gaslight and Coke Company, 7·44 candles; South Metropolitan Gas Company, 8·31 candles; Commercial Gas Company, 7·41 candles. For the two Companies first named, these minima are higher than in the two preceding quarters.

TABLE I.—*Averages of all the Testings of Illuminating Power for the Third Quarter of the Year* [*Candles*].

Company.	No 2 "Metropolitan" Argand.			Flat-Flame.		
	1909.	1910.	1911.	1909.	1910.	1911.
Gaslight and Coke Company . . .	16·77	15·17	14·92	11·64	8·96	8·70
South Metropolitan Company . . .	16·23	15·85	15·73	10·63	10·24	10·04
Commercial Company	14·71	14·79	14·57	8·83	8·71	8·32

Calorific Power.

The results of the testings for calorific power made during the third quarter of the three years are summarized in Table II.

TABLE II.—*Summary of Testings of Calorific Power (Gross and Net) for the Third Quarter of the Year* [*Calories per Cubic Foot*].

Company.	Average.			Maximum.			Minimum.		
	1909.	1910.	1911.	1909.	1910.	1911.	1909.	1910.	1911.
Gaslight and Coke—									
Gross	144·5	137·2	136·6	162·0	147·0	153·4	135·4	127·5	127·8
Net	129·1	122·4	122·2	144·6	132·2	138·0	120·5	113·3	115·5
South Metropolitan—									
Gross	146·8	145·8	143·5	158·8	157·0	160·3	130·3	135·7	133·5
Net	130·5	129·8	128·1	145·2	140·5	144·5	117·3	120·1	119·0
Commercial—									
Gross	140·5	137·6	135·0	150·4	153·4	150·4	130·1	125·7	123·6
Net	125·5	122·8	120·7	134·9	137·9	133·3	116·7	112·4	110·6

The last quarter's figures do not show any very marked difference as compared with the corresponding quarter of last year, though there is a tendency towards a reduction in the average calorific power of the gas supplied. The minimum result for the Gaslight and Coke Company is well above the standard of 112·5 calories net, below which, according to their Act of 1909, the average net value of three consecutive days' testings of the gas should not fall. The Commercial Company, however, have a minimum result of 110·6 candles; but this Company are not under any statutory obligation to maintain the calorific power of their gas to a prescribed standard. Nevertheless, the result again confirms the deduction made from previous quarters' results—that the minimum of 112½ calories net fixed in the Gaslight and Coke Company's Act of 1909 is too high for gas of which the illuminating power is required to be 14 candles, and which is allowed to fall to 13½ candles without forfeitures being incurred.

Sulphur.

Table III. shows the average and maximum results obtained from the testings of sulphur in the third quarters of the three years. The average figures for the third quarter of this year are very nearly the same as the corresponding figures for the second quarter of the year. The coal gas of the South Metropolitan Gas Company now contains the lowest average proportion of sulphur, and, judging by the maxima for the three Companies, is now more uniformly low in sulphur than the mixed gas of the other two. As compared with the figures reported for the sulphur content of the gas shortly after the London Gas Act, 1905, gave the Companies a free hand in respect of sulphur, the results reported for the last two years show, however, a great reduction.

TABLE III.—*Summary of Testings of the Sulphur in London Gas for the Third Quarter of the Year* [*Grains per* 100 *Cubic Feet*].

Company.	Average.			Maximum.		
	1909.	1910	1911.	1909.	1910.	1911.
Gaslight and Coke Company . . .	34·7	37·3	34·1	57·5	71·9	58·5
South Metropolitan Company . . .	41·0	30·3	27·1	64·3	52·3	49·4
Commercial Company	35·5	26·6	29·8	49·2	43 2	61·7

GAS-ENGINE ACCIDENTS.

Some Instructive Experiences.

FAILURES, in gas-engines, as in many other things, mirror weaknesses; and the discovery of weaknesses leads to improvement. This is the reason that one finds so much interest in the annual report of the Chief Engineer of the British Engine, Boiler, and Electrical Insurance Company, Limited (Mr. Michael Longridge, M.A., M.Inst.C.E.); for as he points out in the instructive example now before us, his Company are not mere collectors of premiums and payers of claims, but they employ a competent engineering staff to ascertain how damage and waste can be prevented, and safety and economy promoted. To the attainment of these objects, a systematic study of failures each year is an important aid.

In the very forefront of the report, there is a significant statement which suggests that the gas-engine is annexing ground from the steam-engine. In his report for 1909, Mr. Longridge had to record a rate of increase far below the normal in the engine branch of the Company's business. He attributed the falling off to the deplorable state of trade which then prevailed throughout the kingdom. In 1910, the temporary set-back was recovered; the increase during the year being no less than 10½ per cent. The proportion of gas to steam engines insured has continued to increase. In 1908, there were twenty-seven steam-engines insured for every twenty gas-engines. In 1909, the proportion was twenty-six to twenty. In 1910, it was twenty-five to twenty. Moreover, the gas-engines insured are slowly increasing in size and power, but are still far behind the steam-engines in these respects.

As to the rates of breakdown among insured steam and gas engines, they were 1 in 9·7 and 1 in 10·8 respectively, as against 1 in 10·2 and 1 in 10·4 in 1909. The proportions in which the various parts of the insured gas-engines broke down in 1910 are given in the last column of the following table, which refers to both gas and oil engines:

Breakdowns of Gas and Oil Engines.

Description of Parts which are Believed to have given way first.	Average before 1904.	1904-1908.	1909.	1910.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Valves and valve gear	30·1	33·3	29·6	42·8
Cylinders and cylinder ends . .	19·3	16·1	15·4	8·5
Pistons	9·7	5·0	2·7	5·1
Connecting-rods and their bolts .	11·9	10·3	9·4	9·1
Main shafts	5·1	11·2	13·4	7·9
Governors and governor gear .	5·1	7·0	5·4	3·4
Silencing boxes and exhaust pipes	2·8	3·6	1·3	2·8
Fly-wheels and driving-drums .	5·1	5·4	0·7	2·8
Clutches and couplings . . .	1·7	0·0	0·0	0·6
Frames and pedestals	3·4	1·8	1·3	1·7
Bolts*	4·6	1·5	2·0	1·7
Total wrecks—cause not ascertained	0·6	0·4	0·0	0·6
Main driving ropes and belts . .	0·6	0·6	0·0	0·0
Miscellaneous	—	2·2	7·4	4·5
Gas-producer plants	—	1·6	11·4	8·5
	100·0	100·0	100·0	100·0

* These bolts do not include bolts in connecting-rods, valve gear, or other moving parts; the bolts in these parts being tabulated with the parts themselves.

The causes of these breakdowns may be roughly classified as under:

	Gas and Oil Engines. Per Cent.
Accidents and causes unascertained	35
Old defects or deterioration by wear and tear . . .	29
Weakness, bad workmanship, design, or material . .	19
Negligence of owners or attendants	17

In most of the figures in the final column of the first table a decrease is noticed; and Mr. Longridge pays a tribute, in connection with the change, to Universities and Technical Colleges, the work at which places has replaced rule-of-thumb by calculations based on the laws of applied mechanics. But one of the most welcome indications of the table is found in the figures of the second line—those referring to cylinder and cylinder ends—which may fairly lead to a hope that one of the most serious difficulties in the successful manufacture of internal combustion engines is being overcome.

It is somewhat difficult to make a selection from the information printed regarding the accidents to gas-engines, as it is all more or less instructive, and therefore valuable. The very first case that is represented relates to a horizontal gas-engine that has been doing duty for seventeen years, working on town gas, and would probably have continued doing duty, but for the adoption of a makeshift for supporting a guard in position. The cylinder of the engine was 5¾ inches diameter by 12-inch stroke; the speed being 180 revolutions per minute. The crank-shaft carried one overhanging fly-wheel, from which the attendant was protected by a guard having a central hole, through which the end of the shaft projected. This guard, for some unascertained reason, had fallen sufficiently to rest upon the shaft; and to prevent contact, it had been raised, and held up by a weight at the end of a rope passing over a block hung from a beam above the engine. The rope broke, and the weight fell into the crank-race, when, after breaking several pieces off the mouth of the piston, it finally lodged directly beneath the crank-pin, where it was caught and driven through the bottom of the bedplate by the big end of the connecting-rod. The bedplate was cracked in three directions from the edge of the hole, and the connecting-rod was bent.

Then we have an experience with a horizontal gas-engine, nine years old, with a cylinder 11 inches diameter by 19-inch stroke; the speed being 200 revolutions per minute. One Saturday morning gas began to blow violently through the piston at each explosion in the cylinder. The engine was stopped, and the Company's inspector was sent for. On drawing the piston, a hole about 2 in. by ½ in. was seen in the end; and, on taking out the connecting-rod, the hole was found to have been caused by the set-screw for holding the back brass in the little end of the rod. This screw had worked slack, and had come out. Its head had been broken off and had worn a hole nearly through the end of the piston; and it had finally been driven through the remaining thickness of metal.

A horizontal gas-engine, two-and-a-half years old, fired with gas from a suction producer, supplies an interesting story. The cylinder was 20 inches diameter by 30-inch stroke; the speed, 160 revolutions per minute. The initial pressure on the piston was about 375 lbs. per square inch; the average number of explosions being 50 to 60 per minute. The cap at the big end of the connecting-rod was secured by two bolts. Two sets of bolts were kept; each set being used alternately for periods of six months and then annealed. When near the end of its third six months' run, the upper of the two bolts broke close to the head through a $\frac{5}{16}$-inch hole drilled for securing a feather key for preventing the bolt turning when the nut was being screwed up. The other bolt was bent, drawn down to a diameter of 1½ inches, and broken. The piston, cylinder liner, cylinder, and water connections to the jacket and piston were broken, and the connecting-rod was bent. A fracture appeared to have started at the feather key, and worked its way gradually through the bolt, as the final break covered a very small surface, measuring only 1 in. by $\frac{5}{16}$ in. The cap of the connecting rod was indented by the heads of the bolts—by the head of the upper bolt, nearly to $\frac{1}{16}$ inch; and by the head of the lower one, $\frac{1}{32}$ inch. The butt end of the rod was also marked by the nuts, indicating that at some time the broken bolts on the other pair had been allowed to work with the nuts slack. Whether this, or too high a temperature in the annealing-furnace, caused the breakdown was not ascertained.

There is warning in the typical case of accident to a horizontal gas-engine eight years old, fired with gas from a town main. The cylinder diameter was 20 inches, piston stroke 24 inches, speed 160 revolutions per minute. The water used for cooling the cylinder jacket was insufficient in quantity, and it was heavily charged with lime. The consequence was that the cylinder got overheated, and the end fractured; being the second fractured in the eight years the engine had been at work. The case was one of pure wear and tear; the natural consequence of working the engine hard under adverse conditions. The discharge from the cylinder jackets should never be allowed to rise above 120° Fahr.; and proper facilities should be provided for removing the deposit from the heated surfaces and narrow passages over and through which the cooling water has to pass.

A shaft accident is described in connection with a horizontal gas-engine nine years old, with cylinder 6¾ inches diameter by 15-inch stroke, running at 200 revolutions per minute, with gas from a town main. The engine had one fly-wheel weighing about 800 lbs. The shaft broke in the bearing between the crank and the fly-wheel, after the engine had made about 288 million revolutions, and probably about 50 million explosion strokes. Assuming the initial pressure on the piston to have been 300 lbs. per square inch, the stress* on the neck would be about 21,000 lbs. per square inch. The sole cause of the breakage was weakness. To reduce the stress to 9000 lbs. per square inch, the diameter of the shaft should have been 3⅜ inches, instead of 2½ inches. Mr. Longridge mentions that the shaft of another engine, more than 100 miles distant, but made by the same firm, of the same dimensions, and bearing the next consecutive shop number, broke on the same day and in the corresponding bearing, which is certainly a strange coincidence.

In the following cases the lives of the shafts and the stresses to which they were exposed were also ascertained with a fair amount of certainty: The first has reference to the shaft of a horizontal gas-engine seventeen years old, fired with gas from a town main. The cylinder diameter was 14 inches, the stroke of the piston 21 inches, and the speed 136 revolutions per minute. The shaft had two bearings and carried two overhanging fly-wheels, each weighing about 1750 lbs. The shaft broke in the fillet of the crank-pin after the engine had run about 263 million revolutions, and had made probably about 100 million explosion strokes. The stress on the crank-pin would be between 12,000 lbs. and 13,000 lbs. per square inch. Another instance is of a horizontal gas-engine, seven years old, fired with gas from a town main. The diameter of the cylinder was 13½ inches, the stroke of the piston 21 inches, and the speed 160 revolutions per minute. The shaft had two bearings, and carried two overhanging fly-wheels, each weighing about 1260 lbs. It failed at the fillets at both ends of the crank-pin after the engine had made about 150 million revolutions, and about 67 million explosion strokes. The stress on the pin was from 28,000 lbs. to 30,000 lbs. per square inch. A further example is supplied by a horizontal gas-engine, nine years old, fed by a suction-gas producer. The cylinder diameter was 14 inches; and the stroke of the piston 20 inches. The speed varied from 160 to 180 revolutions; and the number of explosions, from 50 to 80 per minute. The shaft had two bearings, and carried two overhanging fly-wheels, each weighing about 2900 lbs. It failed at the crank-pin after the engine had probably run about 300 million revolutions, and had probably made about 120 million explosion strokes, causing a stress of about 23,000 lbs. per square inch upon the crank-pin. The next instance is that of a horizontal gas-engine, seven years old, fired with gas from a town main. The diameter of the cylinder was 14½ inches, the stroke of the piston 24 inches, and the speed 204 revolutions per minute—the average number of explosions being 50 per minute. The shaft had three bearings, and carried one fly-wheel weighing about 8300 lbs. It broke through the crank-pin after the engine had made about 42 million revolutions, and about 10 million explosion strokes. One more shaft illustration—this being of a horizontal gas-engine, ten years old, fired with gas from a town main. The diameter of the cylinder was 12 inches, the stroke of the piston 18 inches, and the speed 160 revolutions per minute. The crank-shaft was supported by two bearings, and carried two overhanging fly-wheels. It broke through the left-hand neck close to the crank, and was found cracked half-way through the right-hand neck also. The stress was low, only about 8500 lbs. per square inch; but there were practically no fillets at the junctions of the necks with the crank webs. Both necks were examined by one of the Company's inspectors in November, 1909, and found in good order. The engine was said to have worked about nine to ten hours per day; and the number of explosions counted by the inspector at his periodical visits during the two years the engine was insured previous to the breakdown, averaged 40 per minute. These figures correspond to a life of 288 million revolutions or thereabouts, and 72 million explosion strokes.

Turning now to other forms of accident, we have, in the first place, a horizontal gas-engine, about eighteen months old, with a cylinder 18½ inches in diameter by 24-inch stroke, running with suction gas, at a speed of 160 revolutions per minute. The exhaust-pipe, which was 8 inches diameter and about ¾ inch thick, dropped vertically 14 inches from the bottom of the breech end, and then ran horizontally for 9 feet in a trench to join the silencer. The latter was of unusual weight owing to an addition erected on top of the original box. This box was supported on two iron rollers, ⅝-inch diameter, which, in their turn, rested on the concrete bottom of the trench. The distance from the back of the silencer to the end wall of the trench was 2 inches. The exhaust-pipe cracked circumferentially close to the flange by which it was attached to the breech end of the cylinder and on the side facing the silencer. Subsequent examination showed that the concrete under the silencer had been softened by oil and water, and that the rollers had sunk into it. The exhaust-pipe was therefore exposed to the sum of two stresses—one the frictional resistance of the silencer sliding on the concrete instead of moving on the rollers; the other that from the bending moment produced by settlement of the rollers and silencer. The first would be negligible unless something lodged between the silencer and the end wall of the trench; the second, measured in pounds per square inch, would be three-and-a-half times the weight of the silencer and chimney pipe above it, except as modified by the elasticity of the bottom of the breech end and of the joint between it and the pipe. This weight was not ascertained, but it need not have been great to

* All these stresses are calculated on the supposition that all pressures and reactions act through the middle points of the bearings to which they are applied.

cause the fracture, seeing that the internal surface of the pipe would be exposed to a temperature approaching that of a dull red heat. The rollers for carrying the silencer should have been laid on an iron plate, and more space should have been left between the silencer and the wall. This is a typical case.

A succeeding instance of accident shows what a weak point is the lubrication of the side-shaft in many gas-engines; and following is one giving good and sufficient reason for proper allowance being made for the expansion of the liner of a gas-engine cylinder. In most cases it is made. It is, of course, easy to say that the liner having a water-jacket ought to expand but little, if any, more than the casing; but a coating of lime or mud on the former may cause some considerable difference between the expansions of the two. The next case emphasizes an old risk which has been recognized by makers in this country. Involved was a horizontal gas-engine of unknown age, with cylinder 8½ inches in diameter by 15-inch stroke, running at 160 revolutions per minute, with gas from a town main. The air for the cylinder charges was drawn from the interior of the bed-plate, to which it was admitted through slots in one side. The risk of such an arrangement is patent. If by any means—such as leakage past a slightly open gas-cock—gas should be forced into the cylinder during a stoppage of the engine, and if the engine should be stopped with the exhaust-valve open, the space inside the bed would be filled with a combustible mixture of gas and air, which might easily be fired when restarting. Something of the kind evidently occurred in the present instance. The engine had been stopped about an hour to repair the driving-belt; and, on restarting an explosion, with disastrous consequences, occurred inside the bed-plate.

There is also described an explosion in connection with a suction gas plant, which happened, after a week-end stoppage, on the rekindling of the fire, through an accumulation of gas, which was ignited by the fire sending a flame or spark into the pipe leading to the scrubber. On the advice of the Company, water seals and a two-way cock were put in. Nevertheless, a few months later, the cover of the expansion-box was again blown off. This explosion occurred soon after starting the engine after it had been standing for four days. The cause in this case was a bad joint between the expansion-box and its cover, through which air entered the box, and diluted the gas therein. If the attendant had simply opened a cock, and kept the fan working till undiluted gas was obtained at the test-cock, this explosion would in all likelihood have been avoided.

One more cautioning illustration. This is the case of a horizontal gas-engine, fourteen years old, fired with gas from a town main. The cylinder was 7¾ inches diameter by 15-inch stroke; the speed being 180 revolutions per minute. The engine was placed in an outbuilding in which a gas-jet was supposed to be kept burning on cold nights; also the cylinder jacket was fitted with a drain through which it could be emptied. Whether the gas-jet was lighted on the Saturday before the breakdown occurred is uncertain; but it is quite clear the jacket was not emptied, as it was found split longitudinally from end to end on the Monday morning. The breach end was also cracked longitudinally and transversely. The cause of the damage was the expansion of the water in the jacket at the moment of congelation by frost. This is a frequent cause of damage in cold winters, although, Mr. Longridge states, circulars are sent out to all insurers of gas-engines before the cold weather begins warning them of the danger of leaving jackets full of water and engine rooms unheated.

WORKMEN'S COMPENSATION STATISTICS.

THERE was issued a few days ago by the Home Office a Blue-Book containing statistics of compensation and of proceedings under the Workmen's Compensation Act of 1906, and the Employers' Liability Act of 1880. The period dealt with is the year 1910; and, as is customary, the report is divided into two parts. Some notice may now be taken of Part I. (which consists of statistics of compensation cases in certain industries); leaving Part II. (statistics as to administration of the Acts) to be dealt with on a subsequent occasion. The report bears the signature of Sir Edward Troup, who remarks that the returns have again been collected from the seven great groups of industries—mines, quarries, railways, factories, harbours and docks, constructional works, and shipping—statistics with regard to which are made, by or on behalf of employers, in pursuance of the order of the Secretary of State under section 12 of the 1906 Act. These returns furnish materials for a general review of the working of the Compensation Act of 1906 in relation to the main body of the industries of the United Kingdom.

In the seven groups of industries referred to, the number of employers included in the returns was 134,820; and the aggregate number of persons employed coming within the provisions of the Act was over 7 millions, of whom nearly 5 millions came under the heading of factories. Compensation was paid in 3510 cases of death and in 378,340 cases of disablement. The average payment in case of death was £153, and in case of disablement £5 14s. The total amount of compensation paid during the year under the Act in the seven groups of industries was £2,700,325, compared with £2,274,238 in the previous year. It is remarked that when to this are added the costs of management, commission, legal and medical expenses, &c., the total charge borne by the industries named would probably amount to nearly £4,000,000. The annual charge for compensation, taking the seven groups of industries together, averaged 7s. 8d. per person employed. It was again lowest in the case of people employed in factories—being only 4s. 3d. per head. In the case of railways, it was 8s.; quarries, 10s. 3d.; shipping, 12s. 5d.; constructional work, 12s. 10d.; mines, 20s. 2d.; and docks, &c., 20s. 6d. Mines are not quite at the top of the list on this occasion; but the charge per head was as usual heavy compared with some industries. It is, however, pointed out in the report as a noteworthy fact that in the coal mining industry the charge arising under the Act works out at about 0·9d. only per ton of coal raised. It must be borne in mind that the figures given here refer only to compensation paid under the Act of 1906. They do not include compensation paid under any contracting-out schemes, payments made in cases still outstanding under the earlier Acts, damages under the Employers' Liability Act, or costs incurred in legal proceedings; so that they do not represent the total charge upon the different industries in connection with the payment of compensation to persons employed in respect of injuries received. Satisfaction is expressed at the returns themselves, which, it is said, appeared on the whole to have been well made. At the close of the preceding year, forms were issued to every employer on the Home Office lists, on which either to make a return or to intimate the fact of his insurance. Out of 134,049 forms thus issued, only 10,655 were not returned; and there is, it is added, reason to believe that in a large number of these cases the employers were insured. Generally, in the case of highly-organized industries—such as mines, railways, and the more important groups of factory industries—the returns seem to be substantially complete; but in the case of constructional work, shipping, and docks, it is difficult to ascertain all the smaller employers, and a margin of error must thus be allowed for. Except in a few cases. no information is available as to the total amount of wages paid in the different groups of industries during the year; and the ratio between the amount of the compensation and the amount of wages paid in each group cannot therefore be estimated.

Turning now to the separate industries, the first dealt with is shipping. In 456 fatal cases, the compensation paid was £70,533—an average of nearly £155 per case; and in 7544 accidents involving disablement, the compensation was £85,166, showing an average of £11 6s. per case. The number of seamen who were returned as being within the Compensation Act was 250,583. It should be pointed out that, in considering the figures for this industry, there are some special conditions to be borne in mind. No compensation, for example, is payable under the Act in cases of disablement in respect of the period during which the owner is liable under the Merchant Shipping Acts to defray the expenses of maintenance of the injured seamen.

Second in order are the industries carried on in factories to which the Factory and Workshop Act, 1901, applies. Returns are not required to be made in respect of workshops under this Act. The number of factories on the register of the Factory Department of the Home Office for 1910 was 112,370. Of the occupiers of these, 90,245 were stated to be included in the collective returns made by insurance companies, &c.; and 17,709 individual returns were received. The classification is under ten groups: Cotton; wool, worsted, shoddy; and other textiles; wood; extraction, founding, and galvanizing of metals, including conversion; marine, locomotive, and motor engineering and shipbuilding; manufacture of machines, appliances, conveyances, and tools; paper, printing, stationery, &c.; china and earthenware; and miscellaneous. The returns show that the total number of fatal accidents in regard to which compensation was paid during the year was 883, with compensation of £129,468, or an average of over £146 per case; while the number of disablement cases was 152,483, with compensation amounting to £899,727, or an average of £5 18s. a case. Both the fatal and non-fatal cases were much higher than in the preceding year; and this increase was almost entirely due to the metal, engineering, and shipbuilding trades. The total number of persons employed covered by the returns amounted to nearly 5 millions. Compensation for industrial disease was paid in 35 fatal cases, to the amount of £4940, or an average of £141; and in 614 disablement cases, to the extent of £11,045, or an average of £18 per case. The total charge for compensation under the heading of factories was £1,045,180. In individual trades, the compensation works out at 2s. 3d. per head in the cotton industry, 8s. 8d. in the metal (extraction, founding, and galvanizing) industry, 12s. 10d., in the engine and shipbuilding industries, and 5s. 0½d. in the machines, appliances, conveyances, and tools industries.

With reference to docks, the compensation for 174 fatal accidents was £25,586, or an average of £147 per case. There were 13,346 disablement cases, with compensation paid amounting to £106,479, or an average of nearly £8 per case. Compensation was paid for industrial disease to the extent of £181, making the total compensation £132,246. The total number of employees returned was 128,878.

The total number of mines on the Home Office list for 1910 was 3916, owned by 2610 employers, of whom 2053 were returned as insured. Individual returns to the number of 462 were received. Some 95 owners, having 107 mines, failed to make a return or to send in the form stating that they were insured. Of these, some were found not to have worked their mines during the year; the remainder were owners of small mines, very few of which had any accidents disabling for more than seven days. Thus the returns

received in respect of the mining industry appear to have been practically complete. The number of cases of death through accident in which compensation was paid during the year was 1347; while the number of cases of disablement through accident in respect of which compensation was paid during the year was 166,709. Of these latter, 15,377 were cases in which the payment of compensation was continued from the previous year; leaving 151,332 cases in which the first payment of compensation was made during 1910. The amount of compensation paid in respect of the 1347 fatal cases was £220,973, or an average of £164 per case; and in regard to the 166,709 non-fatal cases, £818,302, or an average of £4 18s. per case. The amount of compensation paid in respect of the cases of disease was £42,507; so that the total charge on the mining industry under the Act in 1910 was £1,081,782. The approximate average number of persons employed to whom the Act applies was returned as being 1,072,571 (1,066,239 males, and 6332 females). The great bulk of the amount payable fell, of course, upon the coal industry; for the returns under the Mines Acts showed that only 64 deaths and 4439 cases of disablement occurred at mines other than coal-producing mines. During the year nearly 264½ million tons of coal were raised, besides 3½ million tons of other minerals. Estimating the compensation payable in respect of injuries at other mines at about £30,000, the charge of the Act on coal-producing mines would be, as already mentioned, about 0·9d. per ton of mineral raised. These compensation figures do not, of course, include persons under contracting-out schemes. The number of deaths in 1910 returned under the Mines Act was 1818; but the discrepancy between this figure and the number of deaths through accidents in which compensation was paid during the year is mainly accounted for by the occurrence in the last days of December of the Hulton explosion, which resulted in the loss of 344 lives.

During 1910, there were at work 6890 quarries over 20 feet deep, in addition to a number of shallow open workings of which no complete record exists. For 91 fatal accidents there was paid £11,199, or an average of £123 per case; and for 5823 disablement cases, £35,056, or an average of £6 per case. The number of persons employed in quarries according to returns under the Quarries Act (which exclude persons only casually employed, and those engaged in quarries only 20 feet deep or less) was, omitting the Isle of Man, to which the Compensation Act does not apply, 85,698. The approximate average number of persons actually employed in or about the quarries was given as 90,318. The amount of compensation paid in respect of industrial disease was only £4; so that the total charge on the industry, as shown by the returns, was £46,259.

The next division is that relating to constructional work. The order of the Secretary of State requires returns to be made in respect of the construction of railways, tramways, canals, harbours or docks, bridges, tunnels, water-works, sewers, roads, and other works of engineering. The construction of buildings (except when forming part of an engineering work) was excluded. The intention was to cover as nearly as possible the large body of men engaged on what are known as "engineering works;" but neither the number of employers nor the number of workmen employed in this industry is definitely known. The fatal accidents in respect of which compensation was paid during the year numbered 110, with total compensation paid of £11,069, or an average of just over £100 per case; while the number of cases of disablement was 6566, and the amount of compensation £51,703, or an average of £7 17s. per case. Compensation was paid to the extent of £163 in respect of industrial disease. The total charge for compensation was therefore £62,935.

It is stated that returns were obtained from all the railway companies except the Great Eastern, who have a contracting-out scheme. Among the clerical staffs, there were 3 fatal cases and 63 disablements (including one case of industrial disease—telegraphist's cramp), with total compensation of £1272. This was in respect of 67,233 employees. In connection with the 374,240 other railway workers, there were 410 fatal cases, with £63,392 compensation, or an average of £154 per case; and 21,369 disablement cases, with £111,123 compensation, or an average of £5 4s. The compensation paid in respect of disease amounted to only £437. During the year, the total compensation paid for railway servants (other than clerical staffs) works out at 9s. 4d. per head of the number employed, or, including the clerical staff, at 8s. per head. Taking the Board of Trade figures as to the average weekly earnings of railway servants, and excluding the clerical staff from the total of persons employed, the total compensation charge for the year works out at about 15s. 11d. per £100 of wages paid.

It may be remarked that 24 kinds of industrial disease are included under the Workmen's Compensation Act; and a list of these is included in the report. With regard to the duration of compensation for accidents, it is noticed that cases lasting four weeks and less than thirteen accounted for about 38 per cent. of the total number.

The London and Southern District Junior Gas Association will hold their opening meeting for this session at the Westminster Technical Institute, S.W., next Friday. Mr. A. F. Browne, of Vauxhall, will address the members; and he will be followed by the President (Mr. J. G. Clark), who will deliver an address on "Some Principles of Governing," which will be open to discussion. Refreshments will be provided after the proceedings.

EXTENSIONS AT THE LEIPZIG GAS-WORKS.

THE following account of the extensions carried out at the Leipzig Gas-Works since 1906 has been prepared from a paper read by Herr Reinbard, the Manager of the Leipzig gas undertaking, at the general meeting of the Association of Gas and Water Engineers of Saxony-Thuringia, which was held at Leipzig in May last. The paper was published in a recent number of the "Journal für Gasbeleuchtung."

Extensions which had been in hand since 1902 and were completed in the spring of 1906 comprised chiefly the erection of a gasholder of 1,450,000 cubic feet capacity at the No. I. works, and the general extension of the plant at both the gas-works to raise the productive capacity of each to 3,180,000 cubic feet a day. The work did not, however, include any enlargement of the carbonizing plant, which at the time comprised forty settings of nine horizontal retorts at each works. In the four years 1902 to 1906 the output of gas increased, however, by 21 per cent., and the maximum output per diem in December increased by 18 per cent. This growth in the consumption necessitated further extensions, for which the necessary funds were voted in the autumn of 1905 and the spring of 1908.

The extensions contemplated comprised: At the No. I. gas-works: Enlargement of the retort-house and the erection of twenty settings of horizontal retorts similar to the forty settings already there; provision of conveying and screening plant for coal and coke; erection of a travelling crane in the exhauster and power house; enlargement of the governor-house and the provision of two station meters with drums of 990 cubic feet capacity; a conveying line for purifying material; and the necessary extension of the mains and connections for gas, water, and drainage. At the No. II. gas-works: Erection of a retort-house for twenty settings of inclined retorts, and the erection of ten such settings, each with nine retorts, with conveying and screening plant for coal and coke similar to that in the No. I. works; likewise the provision of a travelling crane in the exhauster house; extension of the storage for liquor and of the sulphate works; the necessary extensions of mains and connections; erection of a gasholder, enclosed in a house, of about 1,950,000 cubic feet capacity; enlargement of the workshops and boiler house; erection of a pipe-testing shed and store; provision of a boiler and five purifying vessels; extension of works railway and conveying line for purifying material; and the laying of a third main, about 2190 yards in length, and 36 inches in diameter, from the gas-works to the town.

These extensions were designed to increase to 8,830,000 cubic feet the maximum daily productive capacity of the two works belonging to the town.

No. I. Gas-Works.

Herr Reinhard proceeded to describe in detail the extensions, commencing with the No. I. gas-works. The power station at this works provides for the electrical driving of all the machinery, and is of a capacity of 300,000 H.P.H. per annum. The power is derived from two gas-engines consuming coal gas, each of 60 H.P., with directly-coupled dynamos for the production of continuous current. A connection is, however, provided in case of emergency with the adjacent Municipal electricity works, and generally the small amount of power required for working at night and on Sundays is taken from this works. The coal arrives at the works in railway waggons, which are discharged by a hydraulically operated waggon tip into a pit, from which it is raised by an elevator. The coal for storage drops through a shoot into the waggons of an electric suspension line, by which it is taken to the different sections in the coal-storage shed, where the waggons are automatically discharged at any desired spot. Coal which is to be taken direct to the retort-house falls from the elevator on to a screen, whence the large pieces pass through a coal breaker, and the broken and small coal are then discharged from an elevator into waggons which pass over an automatic weighing machine. The coal is then dropped on to band conveyors, by which it is discharged into the bunkers above the settings. The whole of this plant is provided in duplicate. Each elevator has a capacity of 30 tons per hour, and the coal-bunker holds sufficient coal for 24 hours when fifty settings are in action.

The whole of the sixty settings, each of nine through retorts 11 ft. 6 in. in length, are charged by means of four De Brouwer charging machines, which travel on rails extending in front of the whole of the settings. These machines take their coal from the overhead bunkers, and are driven by electricity. The three vertical tiers of the retorts are all charged by the same machine, but at intervals of one hour. The charges are worked off in four hours, and the coke is expelled from the retorts by means of a De Brouwer push discharger, of which four are provided, travelling on the same rails as the charging machines. One man attends the discharging and one man the charging machine. At the back of the settings is a wrought-iron trough containing bands which convey the coke, as discharged, to a transverse trough of similar construction, from which it is raised by means of a bucket elevator. One transverse trough is provided for each thirty settings, and is arranged below the stage so as to keep the latter clear. The coke is quenched directly it is discharged into the longitudinal troughs by means of revolving pipe sprinklers, which are under a water pressure of 1 to 2 atmospheres. The bucket conveyors take the coke at night into

two large receivers, each capable of holding the whole production in 14 hours of thirty settings. Thus further handling of coke during this time is avoided. The coke is taken from the receivers in waggons on a rope railway to the breaking and sorting plant, or to the storage ground which extends along the front of the retort-house. The coke breaking and sorting plant discharges the coke either into railway waggons or into sacks. The coke from the store is brought back as required by hand-worked suspension lines to the breaking and sorting plant.

The previously existing condensing, scrubbing, and purifying plant and exhausters have been supplemented by the erection of a second set of the same capacity. Horn's grids are used in the purifiers; and a hand-worked suspension line is used for the transport of the purifying material.

No. II. Gas-Works.

The power-house equipment for this works is the same as that for the No. I. works; but as it is not possible to take a reserve supply of current from the electricity works, the two gas-engines are of larger size—viz., 100 H.P.

In regard to the carbonizing plant, the scheme of extensions already referred to contemplated the erection of a retort-house for twenty settings of inclined retorts and the installation at once of ten of these settings. While the house was under construction, however, two new types of carbonizing plant came into prominence—viz., vertical retorts and large carbonizing chambers. After exhaustive investigation, it was decided to erect, in place of inclined retort-settings, eight inclined carbonizing chambers of the Munich Company's type. These chambers were to be of a productive capacity of 210,000 cubic feet per diem. It is interesting to note that the Munich Furnace Construction Company have undertaken the entire maintenance, and periodical inspection of these settings for a fixed sum per setting per annum for a period of ten years, and to hand over the installation at the end of that period in full working order. It is evident that the installation has given satisfaction in every way, from the fact that a further installation of eight settings of the same productive capacity has been ordered, and is in course of erection.

The coal-conveying plant is similar to the No. I. gas-works. The waggon tip is worked by ropes from a drum. The old installation of forty beds of horizontal retorts has single retorts, which are charged by De Brouwer machines. The carbonizing chambers receive their charge of about 6 tons of coal per chamber in the simplest manner from a bunker of the correct capacity arranged above the setting. The coke from the horizontal retort-settings is removed by a De Brouwer conveying trough in front of the benches; the coke being drawn by means of an Eitle drawing machine. It is quenched in the trough and conveyed to two transverse conveying troughs in the basement, whence it is carried into a reservoir in the same way as the coke at the No. I. works. From the chamber-settings the contents of each chamber fall directly into a quenching tower, where the coke is quenched and passed on to a bucket-conveyor, which takes it to the coke breaking and sorting plant. The condensing, exhausting, and governing plant have been raised to the requisite capacity by the addition of another tar separator, another Beale's exhauster of 1,765,000 cubic feet per diem capacity, another station meter of 1,060,000 cubic feet per diem capacity, and a station governor for 26-inch connections. Another boiler and a suspension line for the transport of purifying material have been introduced. A third three-lift gasholder of 1,980,000 cubic feet capacity has been erected to give increased storage. Special dining accommodation and bath and cloak rooms have been provided in the basement of the carbonizing chamber house for the use of stokers. The new plant has resulted in a considerable reduction in the cost of manufacture of the gas. Based on wages of 5s. per man per eight-hour shift, the cost of manufacturing gas, taking all the retort-house work into account, is about half as much when charging and discharging machines are used as when they are not used, with horizontal retorts, for the same production of gas. The carbonizing chambers were not used continuously; but the amount of gas made with them in the year 1910 was 440 million cubic feet. The number of charges put into chambers was 6853, and the make of gas per ton of coal was 11,734 cubic feet. The coke consumed as fuel in heating the chambers amounted to 13·8 per cent. by weight of the coal carbonized in them. The saving in working expenses by the installation of large chambers was £7000 in the year, compared with horizontal retort-settings of the same output.

The extensions already described at the two gas-works have brought their maximum daily productive capacity up to 8,935,000 cubic feet; while the apparatus is only adapted to deal with a maximum of 8,476,000 cubic feet. Consequently, an increase in the capacity of the purifying and exhausting plant is to be made at once. The increase in the consumption of gas in Leipzig has, moreover, necessitated provision for further extension; and workshops, pipe-store, and a new gasholder of 2,300,000 cubic feet capacity are being erected at the No. I. works. This gasholder is unlike those hitherto erected, in that it stands in the open. The cost of construction is considerably less than that of a gasholder of the same capacity enclosed in a house. At the No. II. gas-works eight more beds of carbonizing chambers with coke quenching and conveying plant, another exhauster, and five purifiers are in course of installation. The whole of the ground available at the No. I. works has now been covered, and later extensions must take place at the No. II. works only. Plans for extending the No. II. works to a productive capacity of 11,300,000 cubic feet per diem are to be submitted to the Corporation this year.

BLEICHERT'S ENGINEERING WORKS AT LEIPZIG.

In the "JOURNAL" of July 4, p. 28, it was mentioned, in the report of the proceedings at the last annual meeting of the German Association of Gas and Water Engineers, that on the last day of the meeting a number of members visited the works of Messrs. Adolf Bleichert and Co. at Gohlis, a suburb of Leipzig. Further particulars of the works were promised by our representative; and they may be fitly given now as an appendix to the foregoing particulars of the extensions at the Leipzig Gas-Works.

The firm of Adolf Bleichert and Co. was founded in 1870 by Adolf Bleichert, who is stated to have been the inventor of the wire ropeway; and at the present time the works cover an area of about 5 acres. The original system of rope transmission which he devised is still in use, though naturally considerable improvements have been made since that date. It was not until 1881 that the works were transferred from another site in the neighbourhood of Leipzig to Gohlis. The existing works were constructed chiefly between the years 1895 to 1904. The rapidity of the growth of the business of the firm in recent years is shown from the fact that in 1880 it employed only 41 workmen, and 22 clerks, &c.; in 1890, 131 workmen and 40 clerks; and in 1900, 189 workmen and 76 clerks. At the present time, there are upwards of 800 workmen and 850 officials and clerks employed.

The various parts of the works were visited by the gas engineers in the following order. The visitors were received first by the Directors of the Company in the Conference Room. The extensive lavatories and bath-rooms provided for the workmen were next visited. Then a specimen crane, with an automatic grab for handling coal, was inspected. Similar cranes are in use at both the Grasbrook and Barmbeck Gas-Works at Hamburg. The large travelling bridge cranes used for loading weights up to 20 tons on to railway waggons, &c., were next inspected. The sidings of the adjacent railway were then visited, and the automatic couplings and the capstans used for handling the trucks by rope haulage were seen in action. The store for iron and steel in sheets and bars for use on the works, containing from 1000 to 1100 tons of material, was then passed on the way to the smith's shop. Among other apparatus in this shop was a screw press capable of exerting a pressure of 100 tons, a steam-hammer with a ¾-ton ram, and a large number of pneumatic hammers, including one controlled by the foot, with a head 1½ cwt. in weight. There is a special shop for the production of the suspension frames for rope and telpher lines, which turns out from 400 to 500 pieces in the month. The boiler-house contains three Lancashire boilers with superheaters, capable of producing about 10 tons of steam per hour at 10 atmospheres pressure. The boilers are fired with brown coal briquettes. The power-house, in addition to steam pumps, &c., contains a turbo-dynamo of 350 kilowatts, and a steam-engine with dynamo of 250 watts capacity. The steam turbine is of the latest type of Messrs. Brown, Boveri, and Co. For furnishing the current required at night-time and on Sundays, a battery of accumulators of 720 ampère-hours capacity is provided. Stores, joiners' and carpenters' shops were next passed through on the way to the erecting shop, which is a building completed in the year 1906, having a length of 295 feet and a width of 82 feet. One end is traversed by a 25-ton travelling bridge crane and the other end by a smaller crane; while under the side galleries are small cranes for lighter work. The two large turner's shops were next visited; then binding and printing rooms—in the latter of which cards, with a view of the works and an inscription recording the visit of the German gas engineers, were being printed for distribution to the visitors—were inspected on the way to a small shop where armatures for the electro-motors used in many types of the conveying plant made by the firm were being wound and finished. A large machine tool shop and turner's shop were next visited, and a number of stores for the parts required in manufacture. The very extensive drawing offices and designing rooms, and the clerks' and administrative offices were gone through on the way to the exhibition room, where working models of the more important types of plant made by the firm were shown in action and described.

The visit concluded with a lecture by one of the members of the firm, in the course of which illustrations of many of the most striking examples of installations of rope and telpher ways for the transport of coal and other goods were thrown on a screen. These included many instances of plant installed at important gas-works on the Continent, but there were also shown many examples of wire-rope and telpher lines installed in South America, Africa, Japan, and other distant lands, for the transport of wood, cement, and other materials.

According to an article in the "Iron and Coal Trades Review," practically the whole of the output of coal from the New Brancepeth Colliery, Durham, is converted into bye-product coke; about 4000 tons per week being produced. Till within some seven years ago, when the first battery of 40 Otto-Hilgenstock ovens was put down, all the coking was done in beehive ovens, of which there were some 320 in operation. A year later, a further 40 ovens were erected, and these were followed by an extension of 15 ovens, which were put into operation about three years ago; the whole of the beehive ovens being then thrown out of use.

THE LIGHTING OF THE GLASGOW EXHIBITION.

High-Pressure Gas.

PHOTOGRAPHS were received last week from Mr. J. R. Milne (Messrs. James Milne and Son, Limited) showing the lighting effects secured at the Scottish Exhibition at Glasgow by the use of high-pressure gas. The reproductions speak for themselves; and should be looked at in conjunction with the particulars of the gas installation that were given in the "JOURNAL" for the 19th ult., p. 747. The illustrations now given show [above] the Fountain Court lighted by high-pressure gas, [below] the Executive Offices and entrances to the Music Court and the Industrial Hall, and the Compressor House.

TURIN EXHIBITION AWARDS.

We have received from the Director of the Exhibitions Branch of the Board of Trade (Mr. U. F. Wintour) the list of British awards at the Turin Exhibition. It includes the following :—

Grand Prizes.—Babcock and Wilcox; Campbell Gas-Engine Company, Limited (3); Curtis's and Harvey, Limited (2); Doulton and Co., Limited; Fletcher, Russell, and Co., Limited; Gaslight and Coke Company (2); J. J. Griffin and Sons, Limited; George Kent, Limited; National Gas-Engine Company, Limited; Read Holliday and Sons, Limited (2); W. F. Stanley and Co., Limited (4); Townson and Mercer; Underfeed Stoker Company, Limited.

Gold Medals.—W. & T. Avery, Limited; J. J. Griffin and Sons, Limited (3); Pulsometer Engineering Company, Limited; W. F. Stanley and Co., Limited; Townson and Mercer; Underfeed Stoker Company, Limited (2).

Silver Medals.—George Kent and Co., Limited; John Ruscoe and Co., Limited (2).

Diplomas of Honour.—Curtis's and Harvey, Limited (2); J. J. Griffin and Sons, Limited; Pulsometer Engineering Company, Limited; South Metropolitan Gas Company (2).

The Cambridge Scientific Instrument Company, Limited, were *hors concours* in several classes in Group II. (Measuring Instruments and Scientific Apparatus), and also in Classes 31, 33, and 34 of Group IV. (Electricity). Messrs. W. F. Stanley and Co. had similar satisfactory awards in Classes 9 to 11 of Group II.; and the Worthington Pump Company, Limited, secured like distinctions in Classes 21 and 22 of Group IV. (Mechanical Engineering).

The preservation of iron in concrete is again demonstrated in the demolition of an old gasholder in Hamburg. This structure was built about 1852, and when taken down 48 years later, the iron anchor-bolts which had been completely encased in a cement concrete were found to be as fresh and bright as new iron, with no traces of rust.

In a recent number of the "Rivista Tecnica d'Elettricita," reference was made to some interesting experiments carried out by Professor Eitner and the Bosnia Electric Company to determine the limits of explosibility of mixtures of air and acetylene. According to an article on the subject in the "Chemical Trade Journal," it appears that with 2·5 per cent. of acetylene there was a slight explosion; but with 2·6 per cent. it was violent and accompanied by flames. The former figure is therefore the lowest limit of explosibility.

ELECTRICITY . .
CANNOT COMPARE
WITH THE NEW
Welsbach
ARC LAMP.

HIGH POWER. LOW PRESSURE.

300, 600, 1000 CANDLE POWER.

MATERIAL.

WORKMANSHIP AND FINISH OF HIGHEST GRADE.

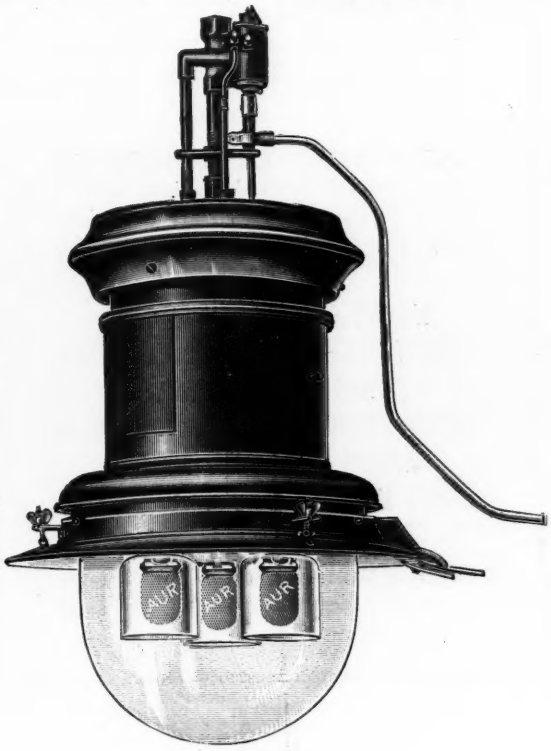


Fig 627.

EFFICIENCY.

MORE THAN 40 CANDLES PER CUBIC FOOT OF GAS.

NOTE:—We are prepared to send, Free of Charge, Sample Lamp for Test Purposes.

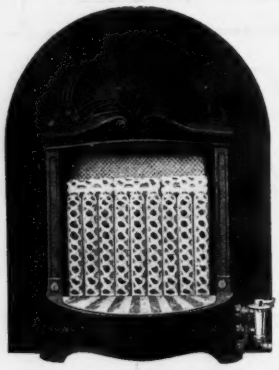
THE WELSBACH LIGHT COMPANY, LIMITED,

WELSBACH HOUSE, KING'S CROSS, LONDON, W.C.

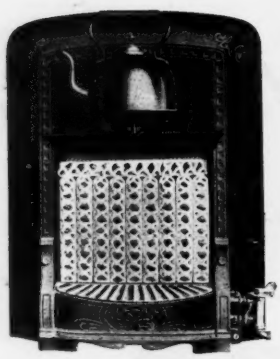
Telegrams: WELSBACH, LONDON,

THE WELSBACH UPRIGHT MANTLES ARE C, CX, & PLAISSETTY.
INVERTED MANTLES—**A SPECIALITY.**

Telephone 2410 NORTH (4 lines).

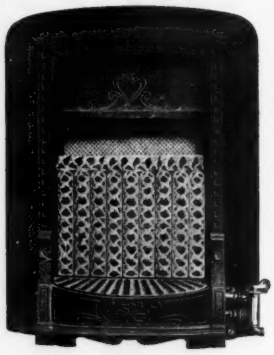


The "CARLTON."



The "SAVOY."
(With concealed boiling burner.)

"WILSON"
GAS HEATING.



The "SAVOY."
(Without boiling burner.)

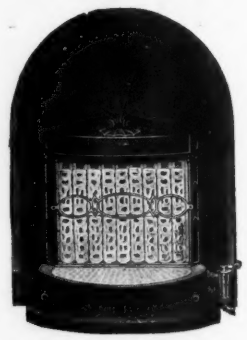
SINCE our inception of the Gas Fire, **DISTINCTIVE FEATURES** of the greatest value in gas-heating have always marked the "WILSON" Fires from others.

THIS SEASON'S DESIGNS worthily maintain the distinction and embrace valuable Patents and innovations only to be found in our Fires; including the

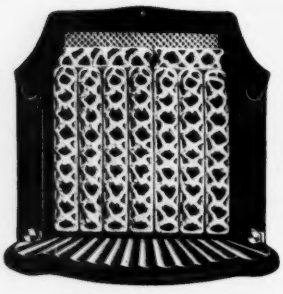
WILSON PATENTED NEW FUEL.
PATENTED REVERSIBLE DUPLEX-BURNER AND TWO-WAY TAP.
PATENT CONCEALED BOILING BURNER.
WILSON REFLECTOR FENDER.
BRAY'S SILENT GAS AND AIR ADJUSTERS,
&c.

GAS ENGINEERS will find these to be the desirable designs for both hiring and sale purposes.

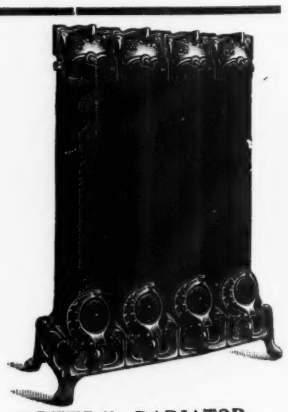
The "IDOL."
(Effective design in eastern style.)



The "ELITE."
(Design which appeals to refined taste.)



"REGISTER-II."
(New pattern for fitting into stove grates.)



"REED" RADIATOR.
(For flueless heating, multiple columns.)

FULL DESCRIPTIVE LEAFLETS ON APPLICATION, AND ALL NEW FIRES READY FOR DESPATCH.

"REED" RADIATOR.
(For flueless heating, single column.)

FROM
WILSONS & MATHIESONS, LTD.,
CARLTON WORKS, ARMLEY, LEEDS.
London Show-rooms:
76, Queen Street, Cheapside, E.C.

THE MAKING OF GAS-FIRE BURNERS.

By H. James Yates, F.C.S., M.I.Mech.E.

It is not without some hesitation that I venture to offer a number of observations and hints which are the outcome of many years' research work carried on by me in connection with gas-fire construction, and more particularly the construction of gas-fire burners. But I hold the firm conviction, in the first place, that the mistrust of gas-fires which still lingers in the public mind must be removed, if gas-fire heating is to be allowed fair play in gaining the wide popularity it deserves, and, in the second place, that the one way in which this can be brought about is by all gas-fires being constructed not in empirical fashion, as too many still are to-day, but on principles arrived at as a result of scientific investigation, and so fitted to commend gas heating to the public by its hygienic value, its practical comfort and convenience, and its economy as a heating agent. If the hints I have to offer should be of some help in this direction—as I venture to hope they may, and so subserve the wider interests of gas heating—I believe I shall not in the long run suffer by making them public now.

Attitude of the Public towards Gas-Fires.

I am afraid that the attitude of the public generally towards gas-fires has been that of tolerance rather than welcome. They have recognized their convenience, but regarded them not as a real substitute for the coal-fire, but as a stop-gap for occasional purposes, which, if constantly used, would not be economical or comfortable. What is now to be done is to demonstrate to the public as a whole the fact which a large section have already come to recognize—viz., that whatever truth there may have been in this view as regards gas-fires of the old school, gas-fires on modern lines can be used to replace coal-fires entirely for all-day use, with all the advantages of the coal-fire, and none of its drawbacks, and with other important advantages of economy and convenience peculiarly their own. The way to do this is that all makes of gas-fires should be, as early as possible, approximated to the best modern types now made; and the present article is offered as a contribution towards this end. I am not, of course, prepared to go the length of disclosing the actual formulæ which I have gradually evolved, and upon which I work; but I propose to deal with principles and methods of construction, both as it has been, and as it ought to be.

Faults of Old Burners.

Reviewing, first of all, the faults that characterized the old gas-fire burner, and which are still found in a lot of modern makes, many gas-fire burners are still constructed to-day without, apparently, any conception of the principles which ought to underlie all gas-fire burner construction. As long as a "blue flame" of a sort is obtained, this seems to be all that is aimed at. There is no evidence of any thought being given, or calculation made, as to the volume of air and gas that has to pass through the burners. The consequence is the gas and the air are never caused to form such a properly proportioned and thoroughly intimate mixture as will afford a correctly aërated flame. It also frequently happens that with varying pressures, or different compositions of gas, the flame gets partially luminous, with the result that the gas-fire radiant is blackened, and the fire burns badly, and smells worse.

Another defect of gas-fire burners such as those referred to, is that owing to the passages in the burners, and the divisions in the burner for allowing the gas to flow from one chamber to another, being of wrong proportions, the flames from some of the teats are almost invariably of unequal length. The consequence is that the fire is not heated up equally. A practice that was, and still is, frequently resorted to in order to get the flames equal, is to vary to an appreciable degree the size of the outlets. While this frequently helps to level the flames, it has the disadvantage of giving flames of unequal bulk, and indeed, as a result, more gas passes through one teat than the other, which also injures the appearance of the fire.

It would seem to be realized by few even to-day what an important point the correct size of the orifice of the teat is. A variation of a sixty-fourth of an inch, either too large or too small, will affect very considerably the character of the flame, its silence, the amount of gas which can be effectively burned, and the heating-up of the radiants. The only way to make certain of getting the desired size is to drill the teats instead of casting the hole. When I first started to do this, it was not without misgiving on the ground of the expense. But subsequent experience has long ago proved that this method was the right one; and it is now practically the order of the day.

The "Venturi Tube" Principle in Gas-Fire Burners.

There has lately been more than one reference in the Technical Press to the effect due to the "Venturi tube" as applied to gas-fire burners. In some cases it has even been suggested that this use of the device is novel. This, of course, is far from being the case. Originally, I believe—though here I stand open to correction—it was adopted from steam practice, where the injector nozzle is surrounded by a tube of such shape that injection is assisted and the pressure and velocity at the outlet of the nozzle thereby utilized to the best advantage. Of course, in gas practice, considerable modification of the shape of the tube has been necessary; and Kern's patent for gas-lighting burners, taken out in 1898, specifies a tube with the internal vertical section of a hyperbola. My own experiments many years ago led me to try tubes with such "chokes" in horizontal burners, and with great benefit to the quality of flames obtained. So far as I have been able to ascertain by experiment, the shape of the constriction does not follow any exact formulæ, but varies somewhat according to each size and pattern of burner, and to several other details—such as the nipple shape, and the bends and the angles in the burner itself. Such bends and angles, however, should be avoided as far as possible. But where they are absolutely unavoidable, they must be carefully designed to minimize both direct friction and the indirect friction caused by eddies. Otherwise there will be serious interference with the quality of the flame.

Shape and Length of Flame.

Another essential point is that the flames must be of such a shape and length as to fit the upward channel in the radiants, without such impingement as would impair the perfectness of the combustion. It is also necessary that each width of gas-fire should have its own specially-designed burner. Merely adding a piece to the length of a small burner, in order to make a burner for a larger fire, is thoroughly bad practice, as every substantial increase of consumption calls for enlargement in all parts of the burner, calculated proportionately to the increased nipple-orifice. This point, however, seems almost universally neglected, if not in many cases unknown, with the result that now the wide-fire principle has become recognized and established and is being taken up by a number of manufacturers, some wide gas-fires are being sold which are very unsatisfactory. As an illustration, one make of 16-inch gas-fire burner which I have tested will pass much more gas through the nipples than it can consume without the flame becoming luminous and so depositing soot. When so adjusted that the combustion is non-luminous, its consumption is found to be no more than approximately that of the same maker's 10-inch fire burner.

My next point is that a perfect gas-fire burner must be so constructed as to be capable of drawing in sufficient air to ensure proper aëration of the flame at all the varying pressures to which the gas may be subject. This condition lacking, there will inevitably be imperfect combustion, outside a very narrow range of variation in pressure. The conditions under which a gas-fire burner works are so peculiar as to almost place the apparatus in a class by itself. This being so, theories regarding the construction of burners, based upon the behaviour of burners in general, are apt to be found quite wrong when applied to this class of apparatus.

Experiments with the Méker Burner.

As a very notable instance, I may mention the Méker burner. As is well known, the combustion in this burner attains a very high degree of perfection. It is to all practical purposes single-cone combustion, and has the very important further feature of silence in burning. When this burner was first introduced, it occurred to me what an admirable burner it ought to make in a gas-fire. But here was a case of theory not working out in practice—so far, at least, as my experiments to the present have led me. These experiments were conducted over a long period, but unfortunately without arriving at any satisfactory improvement. I then got in direct touch with M. Méker, of Paris. I provided him with one of our gas-fires, and pointed out all the difficulties I had encountered in the adaptation of his type of burner, and also furnished him with all information necessary to enable him, if possible, to construct a burner on the lines of his patent such as would suit a gas-fire. After some considerable experimenting, M. Méker eventually sent me a burner which he believed would be suitable. Unfortunately, my tests declared that, when consuming an equal amount of gas to our own, the excellent features of silence and non-lighting back, so conspicuous in the ordinary Méker burner, were not maintained, and the fire yielded a lower percentage of radiation than with our own burner. This does not reflect in the slightest on the well-known merits of the Méker burner, and the skill of M. Méker; they are only mentioned as illustrating the difficulty of adapting to the gas-fire burner contrivances which have proved their value for other purposes. Even if this burner had shown an improvement, it would have had to be a very great one to make it commercially available, for the reason that not only is the Méker burner itself an expensive one to make, but its adoption would have meant the remodelling of our existing patterns of gas-fires. The appearance of the gas-fire would also have suffered very much owing to the alterations necessary to permit of the Méker burner being used. I do not for a moment profess to have myself reached finality in gas-burner construction; but I cordially welcome any and every sign of manufacturers beginning to face, as I have for years been endeavouring to do, the very difficult problems attending the modernizing of the gas-fire.

Accounting for the Heat Units.

In the present-day gas-fires, with the designing of which I am so closely associated, I have made it a great point that the whole of the heat units in the gas are accounted for, and that in the following three directions:

(1) It is absolutely essential that a fair percentage should be allowed to escape by the flue to cause a proper "pull" in the chimney, so as to ensure all the products of combustion being carried away, and none escaping into the room, and, further, to assist in the proper ventilation of the apartment. For this, anything from 15 per cent. to 25 per cent. must be allowed.

(2) At the present time, we regularly obtain in our fires radiation as high as 55 per cent.

(3) However a heating apparatus is made, there will always be a certain amount of heat given off in the form of heated air or convection. Up to within the last few years, gas-fires have been so constructed as to give off the great part of their heat by high-temperature convection, with its overheating of the air and consequent discomfort—the air when raised to a high temperature by convection having, as is well known, an increased capacity for absorbing moisture from any available source, including, of course, the human body, and so causing unpleasant prickly sensations of the skin and mucous membrane. It was partly owing to this defect that gas-fires failed to find adequate favour with the public. I have concentrated much effort on reducing the amount of convected heat to the lowest possible percentage, and ensuring that this percentage should be only given off at a low temperature instead of at a high temperature as formerly. With this in view, I have succeeded in making a series of gas-fires, in which the convection is regularly reduced as low as 20 per cent. to 25 per cent., and that at low temperature.

It is a matter of astonishment to me, and regret also, to see fires still being supplied which are constructed so as to give the objectionable high-temperature convection. Speaking generally, the perforating of the fire-front at the top and bottom of the casting, and the fixing of sheet-iron so as to enclose the back of the fire, is open to the serious objection that, as a result, the air from the room, which is drawn in at the bottom perforations, passes over the very hottest parts at the back of the stove, and is delivered into the room at a high temperature. In order to prevent this result where convection methods of this kind are employed, it is highly necessary to avoid carrying the air-channels over such parts as will so unduly heat it as to cause the results I have indicated.

My next point is that gas-fire burners must be rigidly fixed in position; otherwise, with even a slight movement of the burner, the flame no longer occupies its correct position inside the radiant, and in consequence proper combustion is interfered with, and the efficiency of the fire adversely affected.

I have found by experiment that with some forms of gas-consuming apparatus having no access for "secondary air," perfect combustion can still be obtained by constructing a burner on such lines that a sufficiency of air, both for primary and secondary supply, will be drawn in through the air-inlet of the burner. But a gas-fire is not the kind of apparatus which can work under such conditions; and for this reason it is most necessary in gas-fires to have a secondary supply of air. In other words, free access of air must be allowed to enter through the casting covering the burner, so that the air can have direct access to the flames at the teats of the burners.

The Importance of the Radiant.

However perfectly a burner may be constructed so as to ensure complete combustion, all good work done in this direction will be nullified if the radiants are not properly shaped to receive the flames. If the true relation between flame and radiants were more generally understood, it would prevent types of radiant which are quite at variance with correct principles continuing to be placed on the market, although I notice that this year there are signs of a greater effort to approximate to the proper type. The radiants I employ to-day are the outcome of many years of experiment. They give the best results I have yet succeeded in obtaining from any radiant that I have been able to construct or to purchase. For this reason, I have not at present seen cause to depart from the pattern referred to.

One point which I must emphasize here is the necessity for each particular make of fire being used only with its own specially-designed fuel if the best results are to be obtained. Unfortunately, in these days of competition, and with a perfectly natural desire for economy, there has been an inclination in some cases to try and adopt one type of fuel to suit all fires; but at present this is impracticable without a serious sacrifice of efficiency and liability to trouble. Equally futile is it to get fire-clay manufacturers to supply imitations of one maker or another's own pattern of radiants. Yet one finds one maker or another's own pattern of radiants—specially prepared by him to fit the conformation of his particular pattern of fire, so as to give proper combustion—submitted for quotation to fire-clay firms, who have never had the labour or cost of designing it, who know nothing of gas-fire construction, and who know nothing of the vast importance which both the composition of the material and the minute accuracy of shape play in the modern gas-fire radiant. So the apparatus maker loses the just reward of his labour and skill, and the gas-fires burn badly and throw discredit on themselves and on gas as a heating agent—so true is it that the gas-fire to-day must be a scientifically constructed apparatus.

The Fire-Brick Back.

While on the subject of radiants, it may be as well to mention the fire-brick back. Here, again, one is struck with the great lack of knowledge still displayed. Many existing types of gas-fire might be improved if only it were realized exactly what part the brick back plays in the economy of the gas-fire. I do not, however, propose to deal with this in detail at present. It is more the question of the burner that I am immediately concerning myself with, as if this be wrong no fire can burn even passably, and one fire giving dissatisfaction in a consumer's house may easily lead to a wholesale condemnation of gas-fires among that consumer's friends. On the other hand, if the brick is improperly designed and placed, all it means is that the fire is not so economical and effective as one with a correctly-designed brick.

Ensuring Perfect Combustion.

It would be interesting to know how many people recognize the important contribution the injector makes towards perfect combustion. In fact, when discussing this very point with a manufacturer some time ago, on my using the term "injector," he said: "What part of the stove is that?" and it was only when I explained to him that it was the part which he probably called the "tee" that he understood what I was referring to. This shows what indifference prevails in regard to the real function of the injector. There is no exaggeration in saying the majority of gas-fire injectors to be found on the market to-day are defective.

If a proper mixture of air and gas is to be made, there must be pressure from some source to cause it; and as the pressure of the gas is the only force we have at our disposal, this necessarily has to do the work. Yet in the majority of injectors the contrivance for regulating the gas supply in the nipple of the injector to suit the varying pressures and qualities of gas, is so arranged that the nipple does not cut off specific quantities of gas, but merely throttles the supply, so that the gas, so to speak, dribbles into the burner. The pressure is thus reduced, and becomes insufficient to draw in the necessary primary air. A perfect injector must deliver the gas without in any way baffling its flow, and consequently allow the rate of pressure of the gas, whether the quantity is 1 foot or 100 feet, to remain unaffected, otherwise consistent conditions and regular perfect combustion are impossible.

Among a number of other faults to be found in the present-day injectors, a very noticeable one is the provision which is made for the working of the adjustment. Several of those I have examined would leak if adjustment were frequently made. This is really a very serious matter, and one that should be closely looked into by manufacturers.

Products of Combustion.

Another point still frequently not recognized—provided there is a "pull" in the chimney—is that it must be made sure that the products of combustion really leave the fire by the flue and do not pass into the room from underneath the canopy. During every fire season, I make it a practice to obtain all the new fires placed on the market, and subject them to exhaustive tests; and it is most disquieting to find what a number still allow the products of combustion to pass into the room. This fault arises through one or more of the following causes:—

(1) The canopy not being designed in correct proportion to the adjacent parts.

(2) Sufficient space not being allowed between the canopy and the brick.

(3) The nozzle outlet being incorrectly designed.

The two former points I imagine do not require any elucidation. As regards the third, I would offer some hints which I have found useful. The products of combustion being at high temperature are greatly increased in volume, and the heated air which passes along with these products is also similarly increased. This being so, it is useless to persist in putting small outlets upon their gas-fires—in some cases even as small as 3 inches—and yet expect all the products to be removed, and at the same time the room properly ventilated. In such circumstances it is no wonder that a good many gas-fires now in use give such dissatisfaction, or that when people enter a room where one is burning, they say they can "taste" the gas-fire. Each gas-fire must have a nozzle of a size large enough to not only remove all the products of combustion, but also at the same time ensure the ventilation of the room being not unduly restricted. With bad chimneys, or where the "pull" varies a great deal, gas-fires with elbows on the nozzle outlets are at some disadvantage. Bends or elbows should be avoided where possible; and if the nozzle is set at an angle of about 160°, this will in many cases meet the difficulty. At the same time, of course, the ideal nozzle is one which is adjustable, so that its angle can be varied to meet the peculiarities that arise in different flues.

The Need of Research Work.

In conclusion, let me once more insist on what I am never tired of emphasizing—viz., the absolute necessity for all gas-fire makers to employ chemists and research workers in order to prosecute with skill and scientific method the research work needful to bring and keep their apparatus abreast of modern needs. It will not suffice to talk of doing this, nor stop short at emulously professing one has done it; the urgent necessity is to really do it—and "if it were done, when 'tis done, then 'twere well it were done quickly."

Projected International Lighting Commission.—At the recent International Electrical Congress, the following resolution, proposed by Mr. Leon Gaster, was adopted: "That this congress deems it desirable that an International Commission should be nominated in order to study all systems of lighting and technical problems connected therewith; and, having been informed that the Illuminating Engineering Society of London has the intention of forming such a Commission, and of putting itself in touch with other existing national and international Photometric Committees, the congress approves their taking the initiative in this respect."

THE BASIS OF COAL PURCHASES.

The Opening Lecture of the courses of instruction on "Fuel" at the Sir John Cass Technical Institute was given by Mr. J. S. BRAME, Lecturer on Fuel, on Monday of last week—the chair being occupied by Mr. S. O. Nevile.

Mr. Brame commenced his lecture by pointing out that attention had been directed from time to time to the enormous problem which had to be faced, sooner or later, of exercising every possible economy in the use of the national fuel—coal.

Power gas had already contributed largely to this desired economy, and would contribute still more in the future, both by enabling the unit of power to be obtained at far lower fuel cost than with the steam-engine, and by rendering available a large number of fuels wholly unsuited for steam-raising. In spite, however, of the enormous development of gas plant for power purposes, it must nevertheless be recognized that the reciprocating steam-engine was still the most generally employed power generator, and, further, that the turbine, coupled with electric generation, had made such economies possible that steam-raising was still of primary importance, and likely to remain so for some years at least, since the economy of the water-tube boiler, in conjunction with the turbine, had falsified the view so confidently put forward by some authorities, that the steam-engine would shortly only be found in museums.

It was essential, therefore, to consider what economies could be practised in the purchase and use of fuel for steam-raising; for individual gain to the consumer in lowering his fuel bill by ensuring that he was getting the best heat value for his money, and getting the best results out of the fuel under the boilers, could not but result in considerable national gain in conserving the limited supplies. When it was remembered that coal was the only fuel produced in this country to any extent, and that on it they were alone dependent for their existence as a manufacturing nation, it was surprising that they had really little information to which they could turn for the composition, and more particularly the relative value in practice, of the various seams and their suitability for different purposes. Analytical results had to some extent been collected, and were available; but something far more comprehensive was urgently required. Sir William Ramsay advocated the formation of a permanent Commission which should make an annual stock-taking, with a view to fostering the supplies and enforcing necessary economy. There was also great need for the establishment of a Government Fuel-Testing Laboratory, on the lines of that provided for the investigation of American fuels by the Bureau of Mines. In this laboratory the analytical data and calorific value of over 5000 authenticated samples of coal had been collected, over 600 boiler tests under standard boilers had been made, and over 200 fuels had been tested in gas-producer plants, in addition to briquetting, coking, and washing tests; and the whole of these investigations had been carried out on a proper commercial scale. The results were issued gratis by the Bureau. A comprehensive study of this country's supplies, and systematic information as to the character and suitability for steam-raising, coking, gas-making and power-gas plant of the many coal seams, was surely of no less importance. It was, indeed, necessary if the best was to be made of the supplies; and no Government could spend money to better advantage than in establishing a laboratory on these lines, where impartial tests which would afford data of incalculable value to the consumer and producer could be carried out.

It was remarkable that, in these days of advancement, they still purchased their coal with little or no regard to the heat energy which it contained. It was true that they were able to use only a proportion of the heat units actually present; but it had been conclusively proved that the value of a coal in practice was directly related to its total heating value as determined in a bomb calorimeter. Purchase based on calorific value was the only logical course; and this was being realized by several Governments and large Power Corporations—especially in the United States, where the Government Departments reported a saving of 20 per cent. in their fuel bill since this system had been adopted. Indeed, economy in consumption invariably followed its adoption. Not only was this of great advantage to the consumer, but it had an important national aspect, in that it not only enabled better results to be obtained for a given expenditure of fuel capital, but induced the producer to adopt the best possible means of raising and preparing the coal for market, entailing less waste. The proposal had met with considerable opposition in this country—possibly for two reasons. First, that most producers felt that such a system was all in favour of the consumer; and, secondly, the uncertainty of calorimeter determinations, for, on the same coal, results of the most conflicting character had been put forward from time to time by opposing parties.

Purchase on a scientific basis could only become general when confidence was established in the accuracy of the tests. It would be necessary to have an agreement as to standard methods of sampling, analysis, and calorimetric determinations. That most simple forms of calorimeter were liable to grave errors was well recognized; but unfortunately the idea had been fostered that any operator could get at the true calorific value with one or other of these simple instruments, and the divergent results were no doubt largely due to this cause. For contract purposes no test should be accepted unless carried out in some form of bomb calorimeter by an operator well experienced in its use, since this was the only form of instrument which could be relied on to give results within the essential limits of accuracy, and which could with confidence be accepted.

Purchase under a guarantee of composition and calorific value was open to objection—indeed, it was difficult to make any guarantee for a substance liable to considerable variation, even when obtained from the same seam. The simplest method of purchase would be that of contracting for the coal which, after trials with other deliveries of coals all suiting the conditions of use, afforded the greatest number of heat units per unit of cost; the penny being the most convenient unit of value, or—

$$\frac{\text{British thermal units per ton.}}{\text{Cost in pence per ton.}}$$

Proper tests on subsequent deliveries, if these showed a falling-off in use as compared with the delivery on which the purchase was decided, would enable a complaint to be sustained, which was almost impossible under present methods of purchase. It must be remembered that considerations other than the calorific value of a coal were of importance—the capability of the requisite amount being burned per square foot of grate area, its average size, and the percentage of "smalls," which, if excessive, and more especially wet, led to blocking of air-spaces, smoke, loss of carbon in the ashes, &c. From a trial delivery, these points could be ascertained, and a standard fixed for the contract, and also the standard of calorific values and ash and moisture limits.

The calorific value on which payment should be based would, with coal of a given type, be mainly dependent on the amount of actual combustible present; and if payment were made on the calorific value as delivered, the effect of the non-combustible constituents (moisture and ash) would be eliminated. Since, however, excessive ash was detrimental to the value in greater ratio than its actual percentage, extra deductions were sometimes arranged for in American contracts whenever a certain limit was exceeded. Similarly, excessive moisture (often found in washed slacks) was objectionable, and might well be penalized. In adjusting payments on the calorific value, it was very undesirable to make too fine a differentiation; for while in commercial practice bomb calorimeter results could be relied on within 0·3 per cent., sampling errors might, even under the best conditions, reach 1 per cent. Allowing a reasonable margin, it did not appear necessary to graduate payments to nearer than 2 per cent. differences; and this was the system adopted by the United States Government. With average values for calorific power and prices, a deduction or premium at the rate of 1d. per 100 B.Th.U. variation from the standard would be approximately correct, and roughly equal 1 per cent. variation.

The primary object of such contracts must not be overlooked—namely, making it to the financial interests of the producer to supply constantly a coal of the character and calorific value most economical to the consumer. This could only be achieved by making contracts perfectly equitable. If deductions were made for low calorific value, then premiums must also be willingly forthcoming for coal above the value. With a $\pm$ 2 per cent. allowance, as suggested, a fair margin was given for variation from the standard before any penalty or premium adjustment on the price would be necessitated.

In practice, it was found that the economy resulting from purchase on calorific value as compared with the old system was much greater proportionately than the per cent. deductions for poorer coal would show. Evidently, the knowledge that deliveries would be subject to constant sampling and analysis led to the supply of much better steam-raising fuel for the money. For the small consumer, the expenses, of sampling and analysis would probably counteract any direct benefit he might gain by its adoption; and with a higher grade being regularly supplied to the large consumer, it was possible that the lower grades, previously more evenly distributed, might find their way to the small power plant.

Meeting of German Gas and Water Engineers at Osnabrück.

The twenty-third annual meeting of the Lower Saxony District Association of Gas and Water Engineers took place on Sept. 28 to 30, at Osnabrück; the meeting opening with a reception on the evening of the 28th ult. Technical proceedings occupied the mornings of the two following days; the papers read being as follows: "A Review of Gas and Water Supply," by Herr Hase, of Lübeck; "Technical Works of Osnabrück," by Herr Schwers, of Osnabrück; "The Frank-Caro Process for the Gasification of Wet Peat, with Recovery of Bye-Products," by Dr. Frank, Professor at Charlottenburg; "The Schweeger-Moor Works of the Hanoverian Colonization and Moor Reclamation Company," by Herr Emminghaus, of Osnabrück; "New Systems of Retorts on Gas-Works," by Herr Pippig, Manager of the Kiel Gas-Works; "The Relative Positions of Electricity and Gas," by Herr Lempelius, of Berlin; "The Supply of the Suburbs of Hanover with Gas," by Mr. Anderson, the Manager of the Hanover works of the Imperial Continental Gas Association. There were also papers on the water supply and water-works plant at Brunswick, Hanover, and Lehe. The Osnabrück Gas and Electricity Works were visited by those attending the meeting, on the afternoon of the 29th ult.; and in the evening of the same day the official banquet was held. On the afternoon of the 30th ult. a visit was paid to the Osnabrück Water-Works, followed by an excursion. On the 1st inst., the Schweeger-Moor works, referred to in Herr Emminghaus's paper, were visited.

COAL SUPPLY FOR THE NICE GAS-WORKS.

Improved Unloading and Transporting Arrangements.

THE Nice Gas Company obtain their supply of coal from England; and it arrives by sea. Formerly the coal was conveyed from the ships in the port to the gas-works by horses and carts, and was stored by manual labour. This system has now been superseded by mechanical plant, details of which were given in an article by M. Birlé, Engineer of the Nice Tramways Company, which appeared in the recent number of the "Génie Civil." As considerable economy has resulted from the change, the following particulars of the new arrangements may be of interest. For the use of the photographs to illustrate them we are indebted to M. Birlé.

DETAILS OF THE INSTALLATION.

The rapid unloading of ships involves the employment of machine-worked cranes and the immediate removal of the cargoes to their destination. The port of Nice is favoured in this respect, as the result of the combined efforts of the Chamber of Commerce of the Alpes Maritimes and the Nice Gas and Tramways Companies, all of whom co-operated in carrying out the work about to be described. Electric cranes were provided and operated by the first-named body; the Tramways Company, the concessionaries of the lines serving the port, had powerful electric locomotives constructed for hauling the coal-waggons, and also adopted a new form of tipping-truck; and the Gas Company built coal-pits (with overhead tracks), in which sufficient coal could be stored for nearly a year's consumption. The following are some details of the principal portions of the installation.

Quay Cranes.—Four electric travelling gantry cranes have been fixed between the railway lines on the quays; and two of them are equal to unloading 1000 metric tons of coal. Each crane carries a 28 H.P. motor for lifting, and one of 12 H.P. for turning. The lifting power was estimated at 1 ton 12 cwt. to 1 ton 14 cwt., *plus* the weight of the skip (2 tons). A load of 3 tons of coal can, however, be raised without overtaxing the mechanism. The capacity per hour is 24 skips, or about 40 tons. The motors are actuated by three-phase electric currents at 440 volts, 25 periods; and the cost per hour per ton raised is about 15c. (1½d.) The gantry is constructed of rolled steel, and rests on two legs which run along the ground on rails. The electric apparatus comprises the motors—all armoured and slow-speed—the working controllers, and the resistances. The controllers (also armoured) are of the magnetic blow-out type, and have only a handle for starting, and for regulating and changing the speed of the motor. The current is conveyed to the motor by a flexible cable.

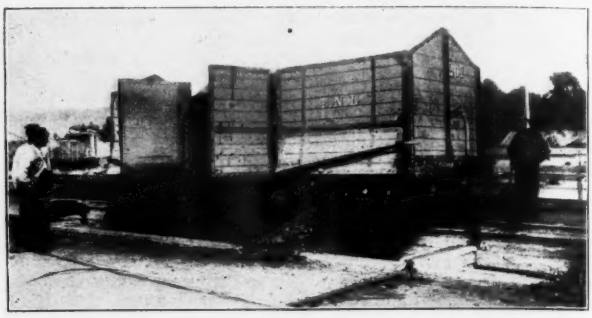
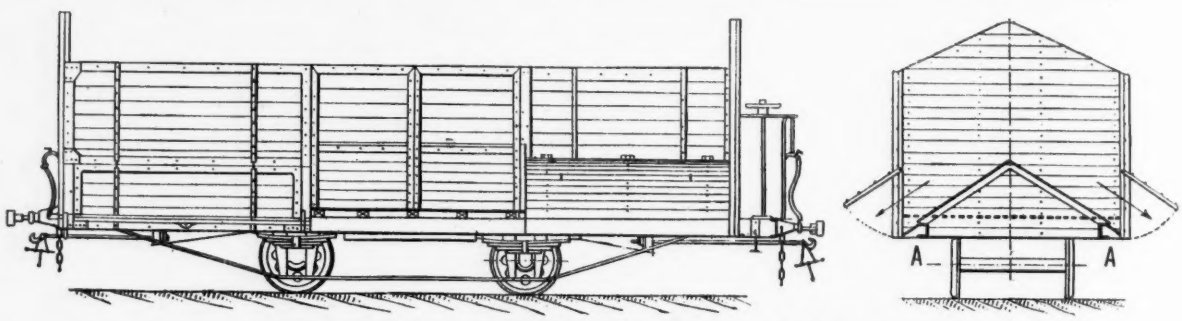


Fig. 1.—Birlé Coal-Waggon with Automatic Discharge.



Figs. 2 and 3.—Elevation and Transverse Section of the Birlé Coal-Waggon.

Haulage Plant.—The coal is removed from the port on the arrival of each ship; and the quantity dealt with annually is 60,000 tons. In order to avoid detention of the ships, it is essential to carry away a considerable amount of coal each day; and on an average about 1000 tons are removed. The railway from the port to the works, however, includes one of the city tramway lines; and, consequently, in addition to gradients, sharp curves, and branches, there are continual stoppages owing to the traffic. The trains of four trucks, each carrying 12 tons of coal, are drawn by bogey traction-engines equipped with electric motors. They are 6 ft. 3 in. wide and about 30 feet long, and are provided with double couplings and special buffers, to allow of their attachment to the trucks of the South of France Railway. The electric plant (that of the Thomson-Houston Company) consists of four motors, two controllers, and four starting rheostats. The atmospheric break is furnished with two electric compressors, and it works two brakes per bogey. The trucks are of the Birlé type, shown in the accompanying illustration [fig. 1]. They have a horizontal floor, but can be easily transformed into automatic tipping waggons. For this purpose the floor is hinged in the middle, as shown in figs. 2 and 3, and can be raised to an incline on both sides. The central doors are completed by lateral ones, which facilitate the

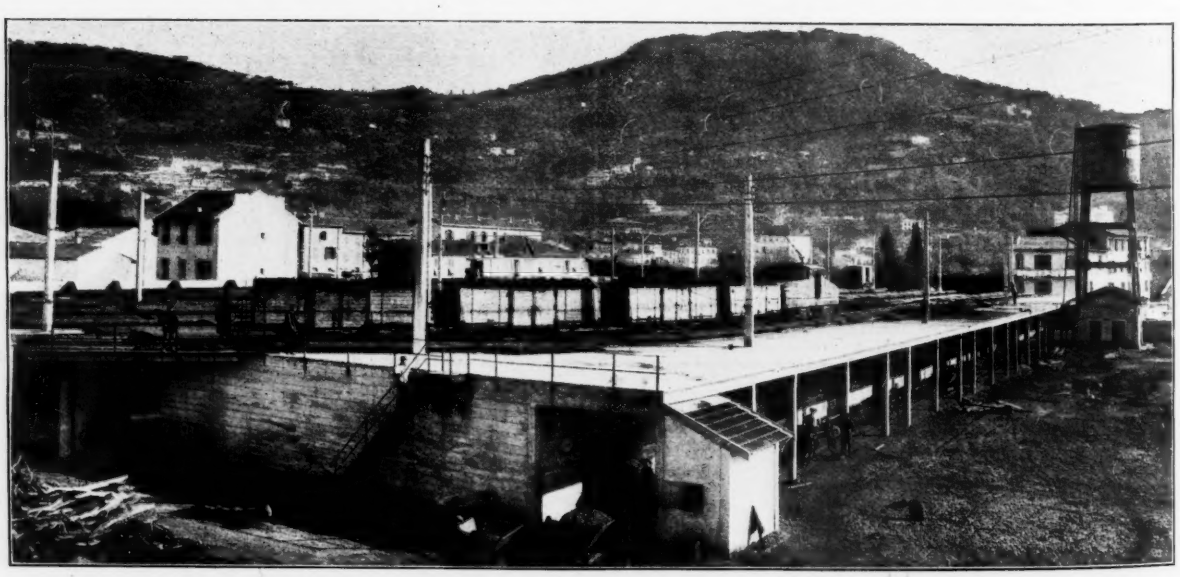


Fig. 4.—View of the Coal-Pits, showing the Waggons on the Overhead Tracks.

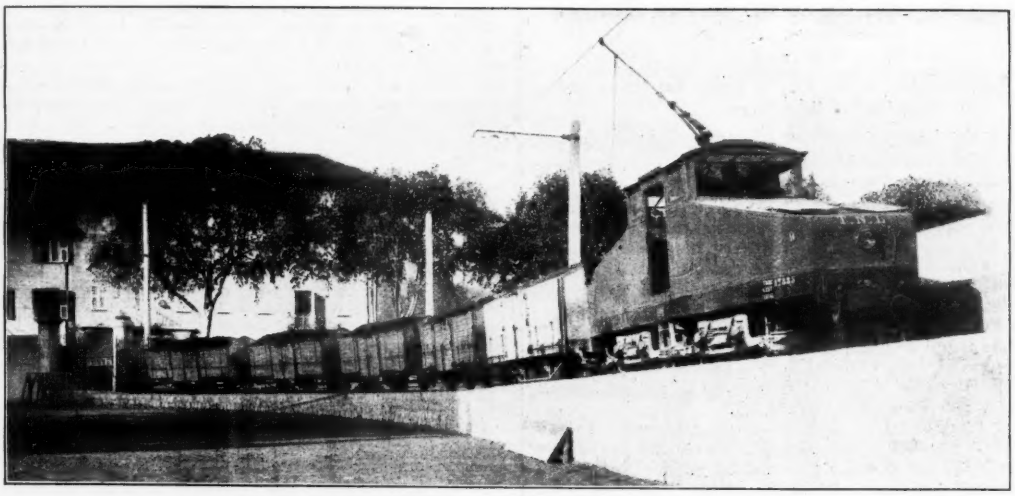


Fig. 5.—Coal Train Mounting the Incline to the Tracks over the Pits.

unloading. These trucks are 21 feet long, 6 feet wide, 4 ft. 9 in. high. The body has no particular features about it; but the floor is independent, and, if necessary, it can be taken out of the truck. It is divided into three parts, which in the horizontal position rest upon the framework, and in the inclined position impinge on the side-pieces A, where they rest by their own weight. The load on the truck is chiefly transmitted to the sides; and this tends to bring the two parts of the floor close together, and thus increase rigidity. To raise the floor when the truck is empty, tackle of any kind may be used. Two men are sufficient for this work with a train of five trucks; and it takes only fifteen minutes. On the edges of the floor being released, it falls back on to the frame-work of the truck

Coal Storage at the Gas-Works.—The coal-pits, built of iron and cement, are contained in a structure 330 feet in length and about 110 feet from front to back, divided into seven compartments 43 ft. 6 in. wide. [See fig. 4.] The roof not only shelters the coal, but is also a roadway upon which run the trains to be unloaded, which arrive by an approach [fig. 5] 300 feet long running from the tramway line, and rising with a gradient of 3 in 100.

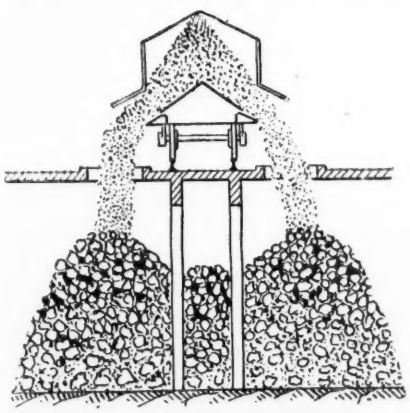


Fig. 6.—Section of a Coal-Pit.

This approach has a fan-shaped end, so as to serve seven parallel tracks, on each side of which are openings through which the coal is shot into the different pits. The operation of unloading is very simple; and no expense is incurred for maintenance. In the portion between the tracks [see fig. 6], the roof is of hollow iron and concrete, with girders placed 20 inches apart and vertical to the tracks, with heavier girders under the rails. Further support is given by two kinds of pillars, fixed on the right of the partition walls and inside the pits. The former are rectangular in section; the larger side being vertical to the partition walls, so as to resist the pressure of the coal against them when the adjoining pits are empty. The other pillars, having to sustain a vertical pressure only, are square. The partition walls are also built of iron and concrete, and have armouring on both sides to resist the pressure of the coal. The approach is formed of two longitudinal beams resting upon pillars, braced with diagonal tie-rods at the higher part, but without any at the lower.

These structures were calculated to stand a uniformly distributed pressure of about 40 lbs. per square foot, and the passage of coal-trucks drawn by a bogey traction-engine weighing 26 tons, and loaded trucks weighing 16 tons. Tests were made by running a load of 25 tons on to a bay having a span of rather more than 16 feet, and the sag observed was less than 1-5000th of the span.

Economic Results of the New Arrangements.

As mentioned at the outset, the coal was formerly conveyed to the gas-works by horses and carts. The contract provided for the unloading of a ship at the rate of 400 tons daily, and the storage of the coal in the works. The cost per ton was: Carriage, 1·25 frs.; unloading and storing, 0·3 fr.—total, 1·55 frs. (15½d.). The contract entered into with the Tramways Company stipulated for a daily transport of 600 to 800 tons, according to requirements. The cost is now: Carriage, 82c.; unloading and storing, 5c.—total, 87c. (say, 8¾d.). Notwithstanding this difference, the Tramways Company estimate that the new tariff will be sufficiently remunerative. To this saving of expenditure by the Gas Company, the following advantages may be added.

Security and Economy of Transport.—Under the old arrangement, the Gas Company were dependent upon labour; and as the demands of workers increase every year, there were no guarantees as to cost such as those which the Tramways Company could offer. The Gas Company have now a fixed tariff. Then the carriage of coal to the works occupied more time than the unloading of the ships. Consequently the coal had to be first stacked on the quay, and subsequently shovelled into the carts. By the abolition of this additional labour, the difference in the weight of coal given in the bill of lading and that recorded at the works—representing loss in transit—decreased to the extent of some 2 per cent. Prompt unloading of the ships being assured, demurrage charges necessarily disappeared. Moreover, the unloading of the trucks at the works is gradual; and the coal is shot into pits previously indicated. The supervision of this work is very simple, and is done by the Tramways Company's men.

Economy of Freightage.—A vessel freighted from England to Nice for a guaranteed discharge of 400 tons of coal daily had to bear a charge of 8 frs. 10 c. (6s. 7d.) per ton. Unloading being more rapid under the new system, the freight per ton becomes: For 600 tons, 7 frs. 8 c.; for 800 tons, 7 frs. 5 c.; and for 1200 tons, 7 frs. 2 c.

The consumption of coal at the gas-works being, as already mentioned, 60,000 metric tons annually, the advantages which have been indicated are productive of considerable economy, the exact extent of which may be calculated from the figures given. The installation is interesting from the fact that a Tramways Company find themselves in a position to undertake the work of unshipping coal and conveying it into gas-works.

Manchester District Institution of Gas Engineers.—The 162nd general meeting of the Institution will be held at Sheffield on Saturday. According to the programme issued by the Hon. Secretary (Mr. W. Whatmough, of Heywood), the members will first visit the Neepsend works of the Sheffield Gas Company, where the Arrol-Foulis stoking machines and large retorts with heavy charges will be seen in operation. By the kindness of the Engineer of the Company (Mr. J. W. Morrison, M.Inst.C.E.), light refreshments will be provided. On leaving the works, the members will proceed to the Grand Hotel, Leopold Street, where the meeting will be held, under the presidency of Mr. Robert Watson, of Doncaster. The business will consist of the reply by Mr. Hudson to the discussion on his paper on "Methods of Increasing Output," read in February, and discussed at the spring meeting; a paper on "Large Retorts and Heavy Charges," by Mr. Morrison; and another on "Coal Storage," by Mr. E. A. Harman, M.Inst.C.E., of Huddersfield. The report of the Scrutineers on the election of officers, committee, and new members, will also be taken. At the close of the business meeting, the members will take "High Tea" together.

REMARKS ON THE OUTSIDE DEPARTMENT.

By R. HALKETT,

Assistant Superintendent of the City of Leeds Gas-Mains and Distribution Department.

UNDOUBTEDLY, the keen competition with our electrical friends was the origin of the outside department; and the same competition, waxing more and more keen, has helped to thrust it into prominence as the years go by. Where formerly the consumer came to the gas manager, now the latter has to seek the consumer by means of his outside staff; and, therefore, his responsibilities have doubled themselves. He seeks to make gas, and also to find a market for it when made; and the larger the market the better, for as the demand increases so the make increases.

But it is out of the question that he can devote his time equally to both branches, and do them justice; and he, therefore, finds it necessary to appoint a head official for the outside work. Otherwise, he would be called upon too frequently to absent himself from his works, which would thereby suffer.

In choosing this official or superintendent, a careful selection has to be made. He really requires to have a certain amount of practical knowledge, combined with good commercial abilities—a man of tact and education, and skilled in the control of men. A technical man may succeed fairly well if he has excellent commercial instincts; but he would need to depend too much upon his subordinates, who were practical, to make a first-class department, and derive full results.

Under his supervision will come the show-rooms, with their manager and staff, inspectors, fitters and their mates, maintenance boys, main and service layers and their labourers; while a clerical staff must also be ready for his requirements.

"Small beginnings make big endings;" and so it may be that in starting an entirely new department in connection with a works, the superintendent may have only a limited staff at his command. But ultimately all these officials of lesser and higher degree will be the natural outcome of his efforts.

All gas undertakings should have a show-room in connection with them, situated in some prominent part of the town, within easy reach of all classes of consumers, and capable of being made most attractive in appearance. It is surprising what a prominent part really excellent show-rooms may take in the sale of gas. It is a great advantage, if they are roomy enough, to allow of one part being set aside to show a sample of every gas appliance properly fitted up and ready for use. Then a consumer may, if he pleases, see the thing actually at work before he buys, and so judge for himself whether it would fulfil his requirements, supposing the circumstances to be favourable. Of the latter, naturally, only a capable man could properly judge; and the gas undertaking will do well to arrange for such contingencies in a manner that I intend to suggest in the subsequent remarks.

First, however, I should like to point out that the manager of the show-rooms needs to be chosen with care. It is not only necessary that he should be a good salesman, but he needs also to possess a certain amount of practical knowledge of the appliances he sells. If he has only a superficial knowledge of his goods, and their merits, he is apt to do more harm than good, and recommend the wrong thing in the wrong place, with the result that the purchasers will become dissatisfied and lose their faith in him. If it ended there, perhaps no great harm would be done; but we all know that grumbling is like a contagious disease, and spreads from one to another with far-reaching results.

A great aim also is to keep down the complaints; and if the show-rooms' officials are ignorant, they are liable to increase the number. They need great patience and tact; and it would be well if they, and all on the outside staff, would endeavour to bear in mind that "one satisfied consumer is worth twenty dissatisfied ones."

One great essential of a good salesman is that he must have a gift for talking, and know how to talk to suit each customer. But he must also have discretion to know when to talk and when to hold his tongue. A man who talks too much will not effect many sales, but will scare away would-be purchasers.

A good incentive to business is for the manager and staff to work on commission, together with a fixed salary. An evil that might perhaps arise from this is that they would then be over-eager to effect a sale, and not very scrupulous as to the suitability of the appliance they sell. And this is where I suggest that they can be checked, and the consumer be assured of gaining satisfactory results from the appliance he buys. The show-rooms should issue a note of the sale effected, with the name and address of the purchaser, and all such notes should be handed each day to the inspectors to deal with. If they are thoroughly trained practical men, they will readily judge, upon calling at the house, whether the appliance sold will prove satisfactory; and if it is not so, they can recommend one that will be. The consumer can then either visit the show-rooms again or leave the selection in the inspector's hands; and he will notify the show-rooms in either case. If the original choice is suitable in every way, then he will merely measure-up and estimate for the fixing of the appliance, and see that fitters are sent and the work properly carried out.

A great deal of good service may be done by the inspectors, and they also have a corresponding scope for working evil. Therefore, perhaps, it is as well to consider what class of man is best adapted for a post of this kind. There are many thoroughly good practical men who could go and judge the qualifications necessary for an appliance, under existing circumstances, to work satisfactorily; and they could tell at a glance whether it was fitted up properly, and how to rectify it if wrong. Merely a knowledge of the work, however, is not sufficient. They are called upon to visit all classes of houses; and the man who has a neat, gentlemanly appearance creates a favourable impression at the first. If, in conversation, he proves not only to have a perfect grasp of his subject, and can talk fluently upon it, but also has a keen business instinct, which keeps the conversation to the point, and avoids waste of time, then the well-to-do consumer is ready to do business with him. But an illiterate, tactless man, no matter how good a practical knowledge he may possess, will often fail to impress the consumer, and perhaps give offence. A practical man is good; but the man who combines practical training with technical knowledge is better. Often a chat with a thoroughly good inspector will lead to further business—that is, perhaps the purchase of fittings may be followed up by a gas-fire, and so on; the inspector being asked to recommend one. But, should he prove distasteful to the consumer in any way—whether in speech, appearance, or business tact—he will close the interview as speedily as possible, and go no further than the matter in hand.

Not only does he come in contact with men of various temperaments, but he also comes in contact with men of various degrees of knowledge; and to each of these he has to adapt himself. There is the ignorant man who is comparatively easy to deal with and quickly impressed; and there is the self-made wealthy man, who would not have it known how ignorant he really is. His susceptibilities are easily wounded; and once offended, he can become a great enemy to the gas undertaking. Worst of any to deal with, however, is the retired gentleman of engineering proclivities. He knows a great deal, and would like to know more; and it is as well for the inspector to tread warily. This gentleman delights to corner him, if he can; therefore, "the least said soonest mended" is the best policy to pursue. At the same time, it is necessary to say just enough to inspire the confidence of this type of consumer.

Builders and architects, as a class, are people with whom it will repay the inspector to ingratiate himself. Canvassers are usually employed for undertakings of this kind; but the inspector can often canvass a little for himself, and it is from the builders and architects that he can frequently obtain the names and addresses of newcomers, as well as from house agents, if he be on friendly terms with them. Not only so, but with the two former his work can sometimes be simplified when piping, &c., for new houses. They will be ready to meet him in little matters, and convenience him where possible.

It is a good plan, when first starting an outside department, to have a canvassing inspector, who will do nothing else for a few months except canvass the builders and architects. In this way, they become thoroughly acquainted with the capabilities of the gas undertaking, and know how far the undertaking will meet them. And it also paves the way for the district inspector and his fitters, who carry out any work obtained by the canvassing inspector. As soon as the district inspector becomes familiar with the builders and architects himself, the canvassing inspector can be withdrawn; for, naturally, they will then like to deal directly with the man who is to carry out the work, and it will be found that they will often send a postcard to the works for him making an appointment, or waylay him when he is on his round. It will be gathered that the inspector's duties are numerous and onerous. He is responsible for the work being satisfactorily carried out. He obtains more work whenever possible to keep his men going. He consults consumers and gives estimates; and upon him it depends whether or not the job pays. All letters and matters relating to his district should pass through his hands; and he is responsible to the superintendent for the well-being of his district.

A thoroughly good superintendent should have had personal experience in inspector's work previously. It is a good thing for the inspectors to be well up in certain facts regarding electric lighting, in order that they are able to make comparisons between it and gas—such as the equivalent in illuminating power and consumption, and also in prices.

It lies within the power of the fitter to lighten the burden of the inspector's responsibilities. A practical, intelligent, neat tradesman is worth all his salary as a fitter. He can be relied upon by the inspector to tackle the most intricate jobs without any undue supervision and anxiety; and he can be trusted to do it without causing the consumer any unnecessary dirt or trouble, or leaving the place unsightly. If, combined with these qualities, he has a discreet tongue, he is invaluable. He can be entrusted to carry out his job quickly and neatly, can grasp at a glance what is required of him, and when questioned by the consumer he can be relied upon not to give long, roundabout answers, which could easily be construed into damaging statements against his undertaking, quite innocently on his part.

It is very trying for an inspector, with a busy day before him, to have to state every little trivial detail to the fitter, to feel that he must be continually "at" him, or he will take too long over his work, and that it will not be done in the neatest way, unless he is round to watch carefully, and that any point will be shirked. It is most annoying, too, to be tackled by the consumer about some question arising from some indiscreet remark of the fitter's, and, although pressed for time, he must stay and patiently explain and propound, until the obnoxious idea is at last dispersed. If

the inspector is a practical man himself, he can very soon work his fitters into his ways, and then be able to rely upon them to do the job just as he would like it done. But naturally, it is an anxious, worrying time to him, until all his men are so trained, and he feels they are thoroughly competent.

The fitters' mates, too, need to be trained to be diligent and careful, with a full sense of the responsibilities resting upon them. The present cry of instruction classes for these lads, and for fitters, cannot be too urgent. It sometimes seems marvellous that so little serious damage is wrought, when one considers how great is the ignorance of many of those who at present fit up the appliances for gas. The majority of fitters for a gas undertaking are drawn from those who have been trained as plumbers and gas-fitters, and have no gas-works experience, and who, therefore, are, perhaps, equal to piping a house, and running the supply and fixing a gas-fire, cooker, or incandescent burner, but from lack of training are ignorant of how to adjust the particular appliance, and what dangers to look for under certain circumstances, and how to remedy them.

A plumber looks upon gas-fitting as a side line to his trade, and does not go into detail. Therefore, a gas undertaking, engaging such a man, soon discovers in what his training is lacking. The inspector should try and find out at first how much the man knows, and give him hints and suggestions at once.

It is a good method, if no classes are available, for members of the staff to give evening lectures to the men—say, once a fortnight, during the winter months, taking such subjects as "The Fixing of Gas-Fires, and their Construction," "Complaints and How to Deal with Them," "Different Systems of Automatic Lighting," "Cookers," "Water-Heaters and How to Fix Them," "Gas-Burners, their Construction, Defects, and How to Remedy Them," and so on. If a short discussion follows, excellent benefits are often the result.

Many a dissatisfied consumer has been converted by persuading him to have his name added to the maintenance list, and his burners properly looked after. The lads need careful training in their duties, so that the consumers' expenses with regard to such items as mantles, chimneys, globes, &c., are reduced to a minimum. Also the lads need to be of a steady, honest character, so that they may be thoroughly trusted.

LEEDS UNIVERSITY LECTURES.

Chemistry of Coal and the Manufacture of Gas.

It was mentioned in the "JOURNAL" for the 10th inst. that arrangements had been made for the delivery, by Professor W. A. Bone and Dr. Harold G. Colman, of a special course of 22 lectures (in two parts) on the above-named subject, at the Leeds University, in connection with the work of the Department of Coal Gas and Fuel Industries with Metallurgy. The lectures will be given on Wednesday evenings at six o'clock, and on Thursday mornings at nine o'clock during eleven consecutive weeks. The following is the syllabus of the courses:—

PART I.—CHEMISTRY OF COAL AND ITS CARBONIZATION.

[Six lectures, commencing Wednesday, Jan. 10, 1912, by Professor Bone.]

Coal—its origin, occurrence, distribution, and ultimate composition. Principal British coalfields. Classification and valuation of coals in respect of their principal economic uses—*e.g.*, for steam raising, gas making, furnace firing, manufacture of coke, &c. Recent investigation on the nature of the "volatile" constituents of coal and the mode of occurrence of nitrogen and sulphur in coal. The influence of temperature on the carbonization of coal, with special reference to the character and yields of gas, tar, ammonia, and coke.

PART II.—MANUFACTURE OF COAL GAS.

[Sixteen lectures, commencing Jan. 31, 1912, by Dr. Harold G. Colman.]

A general description of the plant and processes involved in the manufacture of coal gas and carburetted water gas. Horizontal, inclined, and vertical retorts. Construction of retort-settings. Methods of maintaining uniform temperatures throughout the retorts with simultaneous economy in fuel consumption. The initial treatment of volatile products evolved from the retorts. Hydraulic and dry mains. Condensation. Elimination of tar fog and naphthalene. Exhausters. Wet and dry purification. Cyanide recovery. Other bye-products—*e.g.*, coke, tar, ammoniacal liquor, &c. Manufacture of ammonium sulphate. Spent oxide. Spent lime, &c. Manufacture and carburetting of water gas. Analytical control of gas-manufacturing processes. Discussion of present-day requirements for a public gas supply.

The lectures are open to all persons engaged in any branch of the coal gas, fuel, and metallurgical industries, including power production. The fee for the whole course is £1 1s.; for Part I. only, 10s. 6d. It may be pointed out that the arrangements for the course will enable students living at a distance to attend two lectures by staying one night per week in Leeds.

A course of eight lectures on "Refractory Materials" will be delivered on Saturday afternoons at three o'clock, commencing Jan. 13, 1912, by Mr. Cyril D. M'Court, of Radiant Heating, Limited, and formerly Research Chemist to the Morgan Crucible Company, Limited. His syllabus includes materials for the construction of coal-gas retorts and settings, coke-ovens, metallurgical furnaces, &c. The fee for the course is 10s. 6d.

Inquiries respecting the courses should be addressed to Professor W. A. Bone, D.Sc., F.R.S., the Head of the Department of Coal Gas and Fuel Industries, on or before Dec. 20 next.

NAPHTHALENE EXTRACTION BY WASHING.

Herr F. Pannertz, Chemist of the Corporation Gas-Works at Crefeld, has contributed two articles to recent numbers of the "Journal für Gasbeleuchtung," on the removal of naphthalene from gas by washing with oil. The following is an epitome of the articles.

The author pointed out in 1907 that systematic washing of gas in washers containing so many chambers that the gas would be brought in contact in the last chamber with oil almost free from naphthalene, the use of distinct cyanogen and naphthalene washers, and rational condensation of the gas would put an end to naphthalene troubles. Subsequent experiences have supported this view. At a large gas-works two washers, designed to deal with 1,060,000 cubic feet of gas apiece per diem, were formerly used with the first two chambers as oil washers for the extraction of naphthalene, and the last four chambers as cyanogen washers. The continuance of naphthalene obstructions in the distributing system led to the extraction of cyanogen in the washers being given up, so that the whole of the chambers might be converted into oil washers for the extraction of naphthalene. At the same time, the condensation of the gas was altered, by cooling the gas as rapidly as possible by introducing cold water at the point where it entered the condensers. The object was to produce as much tar-fog as possible, by means of which the greater part of the naphthalene would be removed from the gas, and the naphthalene washers thus relieved. This method of condensation is opposed to the general view that the gas must be condensed as slowly as possible; but the results proved favourable. The tar formed was thinner than formerly, and no naphthalene obstructions occurred in the condensers, as had previously been the case.

After the tar extractors no tar-fog could be detected by the test of exposing filter paper for 1½ minutes to a full stream of gas issuing from a pet-cock. The naphthalene in the gas after the naphthalene washers was reduced to 1·3 grains on an average, or 1·7 grains as a maximum, per 100 cubic feet. Further, the condenser and tar extractor were no longer sprinkled with water or liquor. The object of this change was to avoid the tar being covered with a deep layer of lighter liquid which would prevent the surface of the tar coming in contact with the gas and taking up naphthalene from it. A further result of this change was that the oil removed from the naphthalene washers was completely free from water, and could be distilled without frothing. Also, whereas formerly ½ lb. of anthracene oil was used per 1000 cubic feet of gas treated, and, nevertheless, the naphthalene in the gas in the distributing system sometimes amounted to 7·9 grains per 100 cubic feet, now ⅛ lb., or less, of oil is used per 1000 cubic feet of gas, and the naphthalene in the gas after the washers is reduced to the figure already stated. Unfortunately, the naphthalene in the gas in the distributing system is higher than immediately after the washers. This additional naphthalene has been traced to the purifying material, which had been fouled and revivified several times. The naphthalene in the distributed gas actually ranged from 2·2 to 4 grains per 100 cubic feet. Some time will elapse before the old purifying material containing naphthalene has been used up.

After the wet process for the extraction of cyanogen had been put out of operation, the cyanogen was removed, as far as possible, by the bog iron ore used in the purifiers; and the washing of the gas in the ammonia washers which followed the naphthalene washers was made so thorough, that only enough ammonia remained in the gas to keep the purifying material alkaline without it smelling of ammonia. In the gas distributed, the ammonia averaged 0·04 grain per 100 cubic feet and varied very little. The amount of cyanogen in the gas distributed was lower than when the wet process was used for the removal of cyanogen. It was at the most 3 to 4 grains per 100 cubic feet, whereas higher figures were frequently found when the wet method of extraction was in use. The amount of air admitted to the purifiers was reduced to 1 per cent. from the 1·7 to 2 per cent. used previously, in order to restrict the formation in the material of sulphocyanide at the expense of ferrocyanide. The advantages of the new method of working with sudden condensation and the cessation of sprinkling with water or liquor were shown when, after eight months' working (covering the winter), the apparatus was opened, and no deposits of thick tar and no scales of naphthalene crystals were found. In the upper part of the tar extractor some cellular tarry masses were found, which on examination proved to consist of coal dust and tar covered with scales of naphthalene. Under the old method of working, thick deposits of tar and large masses of naphthalene scales were found in the apparatus. It thus appeared that the tar condensed by cooling in the condensers left no naphthalene in the gas to crystallize out. It was important to bear in mind that the experiments referred to the winter months, and the naphthalene had not, therefore, been dissolved or volatilized owing to the higher external temperature.

For comparison, the author gives the working results obtained and tests made on two days with the same make of gas—one before and one after the change of working had been made. On June 9, 1909, the gas before the naphthalene washers contained 21·6 grains of naphthalene per 100 cubic feet. The condensation had been effected by means of four ribbed condensers and one Reutter condenser. The consumption of oil in washing the gas amounted to ½ lb. per 1000 cubic feet. The gas distributed con-

tained on the average 7·6 grains of naphthalene per 100 cubic feet. On June 9, 1911, after the new method of condensation had been introduced, the gas before the naphthalene washer contained only 17 grains of naphthalene per 100 cubic feet, or 21 per cent. less than previously. Only two ribbed condensers and one Reutter condenser were used for condensation. The consumption of oil amounted to ⅛ lb. per 1000 cubic feet. After the naphthalene washer the gas contained 0·79 to 1·5 grains of naphthalene per 100 cubic feet, though in the gas distributed there were 3·4 grains, due to naphthalene taken up from the purifying material, as already explained. The amount of gas passing through the apparatus was the same on the two days—viz., about 918,000 cubic feet. No trace of tar-fog was found in the gas after the tar extractor by the 1½ minute test. Thus, notwithstanding the reduction by about two-fifths in the condensation surface, the new method effected a considerably better extraction of naphthalene. The spent oil from the naphthalene washers formerly yielded about 17 per cent. of the fraction distilling between 200° and 270° C., whereas now it yields 24 per cent. of that fraction. The fraction contains not more than 70 per cent. of naphthalene.

The author shows that the quantity of naphthalene contained in the spent oil agrees sufficiently closely with the difference between the amount of naphthalene in the gas before and after the washers, taking into account the quantity of gas dealt with. He then gives an example of the action of the different chambers of the naphthalene washer. The anthracene oil used was free from benzol, and had a specific gravity of 1·222 at 59° Fahr. This oil was so far capable of extracting naphthalene from gas saturated with it at ordinary temperatures, that only 0·57 grain of naphthalene remained in 100 cubic feet of gas. Figures are quoted by him for the composition of the oil from each of the six chambers of the washer, and they show that there were only traces of naphthalene in the oil in the last two chambers of the washer. He lays stress on the importance of bringing the gas finally in contact with washing oil practically free from naphthalene.

With regard to condensation, he states that the temperature of the gas at the inlet of the condensers averaged 122° to 131° Fahr.; after the two ribbed condensers, 86° to 90° Fahr.; and after the Reutter condensers, 59° to 63° Fahr. The temperature was slightly raised by the compression in the exhauster and the heat of the surroundings, so that the gas entered the washers at a temperature of 63° to 68° Fahr. The author considers that a low temperature of the gas is essential for the efficiency of naphthalene and cyanogen extraction by washing. He now contemplates using the tar from the tar extractors for sprinkling in the Reutter condenser, in order to take advantage of the power of this tar to take up more naphthalene.

The second paper by the author refers to the testing of oil for the purpose of determining its suitability as a washing agent for the extraction of naphthalene from gas. He remarks that most of the oils used for the purpose are products of the distillation of coal tar or lignite tar, though petroleum has also been used. Some oils are unsuitable because they already contain much naphthalene, and others because their absorptive power for naphthalene is too low. Except for the determination of the amount of naphthalene in the oil, the fractionation of the oil and the determination of the solubility of naphthalene in it are, the author says, of little value in assessing the value of an oil for the purpose. The method which he has used for some years past for testing oils intended for naphthalene extraction is as follows.

Coal gas is passed at a slow rate of flow—viz., 30 to 40 litres at the most in an hour, through two tall cylindrical vessels loosely packed with naphthalene. The gas thus saturated with naphthalene then passes into a small flask or an absorption cylinder containing 20 c.c. of the oil which has to be tested. It then goes into a cylinder containing water acidified with citric acid, and then through two absorption vessels containing supersaturated solution of picric acid. It then passes on to the gas-meter, by which the volume passed through the apparatus is measured. The test is stopped after 200 litres (about 7 cubic feet) of gas have passed through, the apparatus is disconnected, and the picric acid which has not combined with the naphthalene contained in the gas is estimated by titration. A good oil for washing purposes should, tested in this way, at the normal temperature of the laboratory (say 65° Fahr.) not allow more than 0·87 grain of naphthalene per 100 cubic feet of gas to escape absorption. Oils which fulfil this requirement have proved to give good results when used on the large scale. Rubber connections in the apparatus must, of course, be avoided as far as possible, and, where used, the ends of the glass tubes should butt against one another so that the stream of gas is not brought into contact with the rubber.

The author has used for many years for titrating picric acid a solution of barium hydrate with phenolphthalein as indicator. This solution is preferable to other solutions of alkalis because of its freedom from carbonic acid; and it may readily be kept free therefrom by protecting the storage vessel from the outer air by means of a small carbonic acid absorption tube. Protected in this way, the solution of barium hydrate retains its strength for an almost indefinite time. The picric acid solution for titration is boiled, after a few lumps of pumice have been added to prevent bumping, until the smell of gas has completely disappeared; the solution of barium hydrate is then run in. If this boiling is omitted, a deeper reddening of the picric acid solution occurs after the change from yellow to red, owing to the effect of some subsidiary constituents of the gas. A liquid which has been boiled sufficiently long, and neutralized by titration to the proper red colour, will be immediately restored to a pure yellow colour by the addition of a drop or two of solution of picric acid. Exhaustive tests of the method with pure picric acid have demonstrated its exactness, and it has the advantage of giving an extremely sharp and easily recognizable end reaction.

RECOVERING AND CONCENTRATING AMMONIA.

One of the papers prepared for the recent annual meeting of the Michigan Gas Association was on the above-named subject; the author being Mr. James A. Brown. He explained in his prefatory remarks that the paper was not intended to be a general discussion of the chemical principles involved in the different methods of recovering and concentrating ammonia, but merely a set of instructions bearing upon the method in ordinary use in small works. Thinking the instructions might be of value to men in charge of such works, he submitted them, as follows.

A few of the things that make the recovery of ammonia necessary, are: (1) Waste gas liquor cannot be run into the sewer, because the odour would be obnoxious and cause trouble. (2) The ammonia must be removed from the gas, because, if allowed to go forward, it would damage the apparatus in the works and the consumers' meters and fittings. (3) A net revenue amounting to 30 c. to 40 c. per ton of coal carbonized, or 3 c. to 4 c. per 1000 cubic feet of gas, is derived from the ammonia recovered when a proper yield is obtained.

The retort conditions most favourable for the production of ammonia are medium heats and large charges. The yield of ammonia increases with the yield of gas per pound of coal, up to 5·1 lbs., at which point it begins to decrease as the yield of gas further increases. The reason for this is that the ammonia is broken up by exposure to a very high retort temperature.

The crude ammoniacal liquor from different coals differs greatly in composition. The liquor from what is ordinarily known as Island Creek coal will contain about 25 per cent. of fixed ammonia, while that from Youghiogheny coal will contain only about 10 per cent. Only from 10 to 15 per cent. of the total nitrogen in the coal is recovered as ammonia; and it is extracted from the gas in various places in the plant, in the form of condensation and by absorption in water. The following table gives approximately the amounts recovered at the different points:

	Per Cent. Recovered.	Per Cent. Strength.	Per Cent. Fixed Ammonia.
Hydraulic and foul mains	5	0·6	60
Condensers	35	2·0	6
Primary tower scrubber	45	1·0	—
Fresh-water tower scrubber	15	0·3	—

The amount of fixed ammonia will vary greatly according to the kind of coal used.

The point of importance in the condensing system is the maintenance of the proper temperatures throughout. The solubility of ammonia is much greater at low than at high temperatures; and as the temperature throughout the scrubbing system is controlled by the condensers, it is necessary to bring the temperature at the outlet of the condensers to the proper point, in order to recover the ammonia in the scrubbers. No cooling of the gas is done in the scrubbers, except that from radiation and the addition of the fresh water. These temperatures must be maintained at the proper point for other reasons than the recovery of ammonia.

Table of Temperatures.

Position.	Deg. Fahr.
Inlet of Pelouze and Audouin condenser	100–120
,, secondary condenser	95–110
,, primary scrubber	70– 80
Outlet of fresh-water scrubber	60– 70

It will be seen from the table referring to the point of recovery that about 60 per cent. of the ammonia remains in the gas at the outlet of the condenser, to be absorbed by the water in the washers and scrubbers. To accomplish this absorption, intimate contact must be obtained between the gas and the water for a sufficient time. In the ordinary type of tower scrubber, this contact is obtained by wetting the material filling the scrubber, and allowing the gas to travel along the surface at a slow rate. The material which gives the greatest wetted surface and allows the gas to pass with the least amount of back-pressure has been found to be wooden trays, made up of boards on edge with dividing strips. Another scrubber, which has been found very efficient in getting this intimate contact, is of the rotary type; but this is not generally used in small works.

Ammonia being very soluble in water, and at the ordinary temperatures at which scrubbers should be maintained, one volume of water will absorb 600 volumes of ammonia. A gallon of fresh water will absorb 3½ lbs. of ammonia at these temperatures; and as there is only about 0·3 lb. of ammonia in 1000 cubic feet of gas at the scrubbers, it is apparent that there is always sufficient water added, if proper time-contact with the gas is obtained. In order to ensure this intimate contact, the following points must be watched.

Ensure Even Distribution in the Top of the Scrubber.—It is very necessary to have the liquor with which the gas is to be scrubbed evenly distributed over the surface of the scrubbing material. This is accomplished by various methods, among the best of which are: (1) To have the liquor at the top of the scrubber

impinge on a properly shaped block, which will scatter it evenly over the surface of the scrubber. (2) To admit the liquor at intervals with a flush-tank in such large quantities that there will be no question of its being distributed over the entire surface of the material. This is necessary where it is difficult to properly distribute a small quantity of liquor. (3) To use a revolving distributor, made of a pipe extending radially from the centre, and attached in such a manner that it may revolve around it. This pipe has two or three openings in the side; and these openings being made in such a way that they distribute the liquor over a certain part of the radius of the scrubber, the resistance against the gas of the liquor emerging from these openings will cause the pipe to revolve round the centre of the scrubber.

Keep Plenty of Liquor Circulating through the Primary Scrubber.—To ensure the absorption of the greatest amount of ammonia, the liquor is sometimes re-circulated in the scrubbers by means of a pump. Per 1000 cubic feet of gas, 50 gallons should be a sufficient rate to pump liquor through the scrubber. As this liquor is always saturated, no appreciable loss of illuminating value will result from re-circulation. It is necessary, however, to separate the liquor from any tar that might accumulate, and re-circulate only the liquor, for the reason that tar at the temperatures maintained in the scrubbers will rapidly absorb the illuminants from the gas. Re-circulating a large quantity of crude liquor in the primary scrubber takes out a considerable amount of sulphuretted hydrogen; thus lessening the work on the oxide purifiers.

Use Fresh Water.—Sufficient fresh water is admitted to the final scrubber to absorb the last traces of ammonia; and the liquor from this scrubber is also sometimes re-circulated. With the ordinary type of tower scrubber, the amount of fresh water necessary to completely absorb the ammonia from the gas is found to be about 4 gallons per 1000 cubic feet; and this is a safe quantity to employ at the proper temperature. When using it, the strength of the crude liquor in the well should be from 0·9 to 1 per cent. of ammonia. If, with the proper temperature, the quantity of water named is found insufficient, and there is an even distribution of liquor in the top of the scrubber, it would indicate that the scrubber trays need cleaning or replacing.

Make Daily Tests with Litmus Paper.—Daily tests should be made at the outlet of the fresh-water scrubber, to ensure that no ammonia is being carried forward in the gas. These tests should be made with sensitive red litmus paper; and should it be found at any time that the litmus will discolour to any appreciable degree within 30 seconds, too much ammonia is going forward. This would indicate that insufficient water was being admitted to the fresh-water scrubber, that the distribution throughout the scrubber was poor, that the temperatures throughout the condensing and scrubbing system were too high, or that the scrubber trays were dirty or clogged.

Keep Trays and Material Clean and Tanks and Wells Covered.—If the scrubbers are maintained at the proper temperature, and the liquor is evenly distributed over the material, and 4 gallons of water will not completely absorb the ammonia, it is evident that the material should be removed and cleaned, as it will possibly, after some time, become clogged with naphthalene or tar. The crude liquor should be stored in a covered well or tank. If open to a circulation of air, the amount of fixed ammonia in the liquor will increase; also some ammonia will be volatilized and lost. Any leakage from these wells will represent considerable waste of ammonia, and should be constantly guarded against.

In the recovery of ammonia in the washers and scrubbers, a double purpose is accomplished. If sufficient time-contact is allowed, the ammonia will combine with the sulphuretted hydrogen and the carbonic acid, and the scrubbing water will also absorb them; thus relieving the purifiers of considerable work. To accomplish any appreciable absorption of sulphuretted hydrogen, the gas must be thoroughly scrubbed with liquor containing uncombined ammonia. Under the best conditions with tower scrubbers, about 40 per cent. of the sulphuretted hydrogen in the gas can be removed in the crude ammoniacal liquor. In order to accomplish a proper absorption of sulphuretted hydrogen, it is usually necessary to re-circulate in the scrubbers the liquor from the hydraulic main and the condensers, as it contains uncombined ammonia.

It should be unnecessary to emphasize the importance of guarding against any leakage in the pipe-lines and through the walls of the tanks and wells; for any leakage, however small, will have a serious effect on the yield of ammonia obtained.

To summarize: In order to recover the ammonia from gas, the following operating conditions must be maintained throughout the condensing and scrubbing system: (1) Proper temperatures in the condensers and scrubbers. (2) Even distribution in the top of the scrubbers. (3) If a re-circulation system is used, see that the circulation is continuous and sufficient. (4) Use about 4 gallons of fresh water per 1000 cubic feet in the final scrubber. (5) Make daily litmus-paper tests of the gas at the outlet of the final scrubber. (6) Keep trays and scrubbing material clean. (7) Keep all wells and tanks covered and protected from air circulation and the sun's rays. (8) Ensure against all leaks in pipe-lines and wells.

The author then proceeded to give directions for operating the ammonia still. Summarizing his remarks, he said: The ammonia still is very simple in theory, but needs constant care and supervision to operate properly. There is probably no other piece of apparatus used in gas-works that requires as much attention as the ammonia still. A certain balance must be maintained between the temperatures at the outlet, the strength of the crude liquor, and the amount of ammonia found in the waste. If one of these things varies, the others will vary, with possibly an accompanying loss of ammonia or a make of weak concentrated liquor. When this balance has once been determined, the condition should be maintained constant at all times. The following points are those to be looked after: (1) Keep the strength of the crude liquor constant. (2) Keep the rate of the crude-liquor feed constant. (3) Keep the temperature constant at the outlet of the still. (4) Keep the temperature constant at the outlet of the condenser. (5) Keep the absorber at the proper temperature. (6) Keep the proper amount of milk of lime flowing in at a constant rate, and have this of constant good quality. (7) Eliminate all leaks. (8) Test waste liquor daily.

In conclusion, the author gave directions for the testing of ammoniacal liquor.

SULPHATE MANUFACTURE IN SCOTLAND.

Utilization of Shale.

A correspondent has sent to the "Chemical Trade Journal" the following remarks concerning the change that is taking place in the Scottish mineral oil trade, in the attention which is being given to the manufacture of sulphate of ammonia.

Sulphate, as a profit earner, has taken the place of oils and even paraffin wax. The Pumpherston Mineral Oil Company, for instance, have three sulphate of ammonia plants—one each at Pumpherston, Seafield, and Dean's works; but all their oil and wax-refining plant is concentrated at Pumpherston. The latest plant for the extraction of sulphate from shale, and in active operation at Pumpherston, consists of a number of cylindrical retorts set vertically in ovens, each oven containing four cylinders. Heat is applied externally from the combustion of the incondensable gases obtained from the distillation of the shale, and also from producer gas. The heating gas enters near the bottom of the retort, along with a certain quantity of air; and a temperature is maintained at this portion of from 1200° to 1600° Fahr. The nitrogen of the shale is thereby converted into ammonia, which is preserved by a continuous supply of steam delivered at a slight pressure into the bottom of the hopper.

The oil gases are distilled from the shale in the upper portion of the retort at a temperature of about 900° Fahr., and along with the ammonia gas are drawn off by the exhausters at a branch pipe at the top of the cast-iron retort, through the atmospheric condensers. The condensed liquid oil and water containing ammonia flow into a small separator tank, in which, by difference of specific gravity, they assume different levels, and are drawn off into separate receiving tanks.

After being "washed" for ammonia, by the ammonia scrubbers, the gases pass through the naphtha scrubbers, where the lighter gases, which could not be caught in the atmospheric condensers, are washed with oil, and a good quality of light oil or naphtha is recovered, and the uncondensable portion goes to heat the retorts. A shale of average yield not only supplies sufficient of these uncondensable gases to heat the retorts, but also leaves a surplus for burning under steam-boilers. The poorer qualities of shale are deficient in gases.

The ammonia water obtained from the atmospheric condensers is pumped through a heater, in which the temperature is raised by the waste water flowing from the still, and passes through the still in the ordinary way. The ammonia gas afterwards enters the usual scrubber for fixation with sulphuric acid to form sulphate. The plant is constructed to make the fullest use of every product. The waste steam and waste gases are sent to the retort. The weak acid liquor from the refinery is saturated with ammonia gas, and after being allowed to settle is put into the saturator. The sulphuric acid tars obtained in the refinery are steamed and washed; the resulting acid liquor flowing to the sulphate house, while the tar is mixed with other waste tars and used as fuel.

Swiss Association of Gas and Water Engineers.

The thirty-eighth annual meeting of the Swiss Association of Gas and Water Engineers was held at Freiburg (Switzerland) on Sept. 23 to 25. After a reception on the evening of the 23rd ult., the technical proceedings opened in the Council Chamber the following morning with an account of the development of the Freiburg Corporation Gas-Works, by the Manager, Herr Schaller. Other technical communications included a paper on the water supply of Freiburg, by Herr Maurer, and a paper on the water supply of Bâle, by Dr. Miescher. There was a paper on the continuous vertical retorts at the new gas-works at Lausanne, by the Manager, Herr W. Cornaz [*ante*, p. 172]; and a note on inland gas tars, by Dr. Schlöpfer. The report of the Photometric and Heating Committee of the Association was also taken. Visits were paid on the afternoon of the 24th ult. to the Corporation Water-Works, Gas-Works, and Electricity Works. On the evening of the same day the banquet of the Association was held. An excursion was arranged for the following day.

Town Supplies of Gas from Coke-Ovens.—It is reported in the "Journal für Gasbeleuchtung" that the small town of Blumenthal, in the province of Hanover, which had had plans prepared for the erection of a gas-works, has decided to give up the scheme and take a supply of coke-oven gas from the North German Mine at Oslebshausen. The coke-oven gas will be delivered into a gas-holder of 35,000 cubic feet capacity (now being constructed), and will be delivered thence to the distributing system, which is to be of Mannesmann tube.

YORKSHIRE JUNIOR GAS ASSOCIATION.

This year, for the first time in the history of the Association, the opening meeting of the session did not include the annual lecture which has hitherto been a characteristic feature of the Yorkshire Juniors' programme. As the Leeds University rooms were on Saturday the scene of an important conference, the venue of the meeting was changed to the Mechanics' Institute, Bradford. Typical of the healthy and flourishing condition of the Association, a very large gathering faced the retiring President, Mr. F. Scholefield, when he took the chair. The reports of the Secretary and Treasurer were accepted and approved; both being looked upon as satisfactory, not only as regards the work done by these officials, but as indications of the vigour and soundness of the Association's work.

Mr. SCHOLEFIELD, in laying down the office of President, assured the members that, though he assumed his office with some amount of fear and trembling, it had been a happy year for him; and he cordially thanked the officials and the members generally for their assistance and support. He was very glad to be able to point to such favourable reports as had just been laid before them, and to find in them proofs of the advance they were making. His chief regret was the smallness of the success that had resulted from their efforts to support the Leeds University authorities by appealing to the Yorkshire gas undertakings to facilitate the attendance of some of their employees at the special gas courses organized by Professor Bone. Circulars had been sent out to all the companies and committees concerned, and to the engineers; but the net outcome had been small, even in the number of replies and acknowledgments received. He trusted they might even yet see a copying of the example of some of the local authorities, who had agreed to set selected employees at liberty for sufficient time on the ten Thursday mornings when these lectures were given. He hoped to see a wider recognition of the fact that, the better their men were fitted, the better it was for the authorities who employed them. He had special pleasure in introducing their new President, Mr. C. D. Cawthra, of Halifax, who had on other occasions earned their gratitude by stepping into the breach, but never so amply earned it as on the present occasion. Their Senior Vice-President, Mr. W. N. Booth, having been appointed to the Managership of the Woolwich Arsenal Gas-Works, had been unable to undertake the presidential duties that should have devolved upon him; and the Junior Vice-President was also unable, for special reasons, to take his place. Consequently, a new President had to be secured, ready for immediate service; and the members had shown their appreciation of Mr. Cawthra's willingness to serve them by returning him unopposed.

Mr. C. D. CAWTHRA, in thanking the members for the honour done him, assured them that the newly-elected President's customary words of fear and hesitancy were the real expression of his feelings just then. Their good wishes followed Mr. Booth, whom last year they had designated to be the occupant of the chair on this occasion, though they regretted losing his presence and valuable assistance in their discussions. He trusted they would take into consideration the special conditions under which he accepted office, would pardon his unpreparedness, and be lenient to him in any respect in which he fell short of the tradition of the office.

The officers were thanked for their services during the past year, on the proposal of Mr. J. W. LEE, seconded by Mr. ATLEY; Mr. F. SCHOLEFIELD responding.

A vote of condolence was passed with the widow and son of one of the members who had died during the summer—Mr. E. Gothard, of Ossett.

A resolution was passed congratulating Professor J. B. Cohen, who had lectured to the Association at the previous annual meeting, on his election to a Fellowship of the Royal Society.

An alteration was made to the rule regulating the admission of members to the Association, thus bringing it approximately into line with that of the other Junior Associations. Previously, with the exception of articled pupils and those holding a recognized official position, applicants for admission were expected to show proofs of having given serious study to their professional work by having passed one of the Gas Examinations of the City and Guilds Institute. It was felt that the time had come when the stringency of the rule might be relaxed, and the eligibility of any *bonâ fide* gas-works employee recognized, subject to approval of his application by the Council of the Association.

The ballot for officers resulted in the following elections:—

President.—Mr. C. D. Cawthra, of Halifax.
Senior Vice-President.—Mr. W. W. Atley, of Normanton.
Junior Vice-President.—Mr. C. T. B. Roper, of Bradford.
Treasurer.—Mr. C. H. Turner, of Mirfield.
Secretary.—Mr. E. Garsed, of Elland.
Assistant-Secretary.—Mr. W. Cranfield, of Halifax.
Council.—Messrs. A. Edwards, of Leeds; G. W. Fligg, of Dewsbury; J. H. Hill, of York; P. M'Nab, of Bradford; F. Scholefield, of Dewsbury; E. J. Sutcliffe, of Bradford.
Auditors.—Messrs. A. Lister, of Yeadon, and G. H. Walker, of Elland.

At the close of the business meeting, the members adjourned to the Thornton Road works of the Bradford Corporation, where the largest installation of Glover-West vertical retorts yet ordered is in course of erection. Mr. Charles Wood, F.C.S., the Bradford Gas Engineer and Manager, welcomed the visitors, gave a few words of description, and then made them free of the whole works. In addition to Mr. Wood, there was present the Superintendent of the works, Mr. E. Gillett, several of the other Bradford Superintendents, and other members of the staff, and also Mr. Haddock, the Contractors' representative. All were freely plied with questions, and every effort was made to satisfy the visitors' thirst for information.

On the conclusion of the visit, tea was kindly provided by Mr. Wood, who was cordially thanked, on the proposal of Mr. C. D. CAWTHRA, supported by Mr. J. H. HILL and Mr. W. CRANFIELD.

The following is a description of the

THORNTON ROAD GAS-WORKS OF THE BRADFORD CORPORATION.

These works were the second of those erected by the old Bradford Gas Company; and gas was first made here on Nov. 16, 1846.

The works cover an area of about 3·3 acres, and, prior to the commencement of the present alterations, consisted of two complete gas-making plants worked in parallel, each of about 900,000 cubic feet capacity per day. The two retort-houses were side by side, with coal-stores between, and also on the west side of No. 2 house; each house containing 160 through retorts 19 inches by 13 inches, in sixteen settings of fives, direct fired.

Eight settings of retorts, comprising one-half of No. 2 house, have now been dismantled, to allow of the building of the first half of the vertical-retort installation; and it is intended early next year to pull down the whole of the remaining horizontals and retort-houses, so as to proceed with the second half of the vertical installation. When completed, the carbonizing plant will only occupy about one-third of the area of the old plant; and the space so obtained will be very useful for coke storage, &c.

The contract comprises a plant capable of carbonizing 176 tons of coal per day, equivalent to a make of rather over 2 million cubic feet.

Two benches of retorts are to be erected, each consisting of four settings, with eight retorts in each setting, making a total of 64 retorts. The total length of the retorts will be 23 feet—20 ft. 8 in. being clay retort and 2 ft. 4 in. iron; and around the latter the secondary air will be heated. The retorts are to taper from 30 inches by 12 inches at the top to 35½ inches by 21 inches at the bottom.

The coal-handling machinery included an automatic coal feeder and breaker, with bye-pass for small coal, which are to be fitted up in a pit at the north-west end of the structure.

A gravity bucket conveyor will deliver the coal from here into the overhead coal-bunkers above the settings, which are to hold 48 hours' supply of coal. As the whole of the coal used has to be carted into the works, this will obviate any week-end carting, coal handling, &c., at overtime rates.

The plant will comprise West's coke-conveyors delivering into the centre pit at the south-east end of the structure, on to a cross-conveyor, which will deliver the coke to storage-hoppers graded according to size, or to the coke yard, as required.

The coke-extractors, coke-conveyors, and coal-handling plant will be driven by gas-engines, mostly in duplicate; while the inclined coke conveyor will be electrically driven.

A plan of the plant was published in the "JOURNAL" for Dec. 20 last.

The building, which will be 184 feet long by 39 ft. 9 in. wide, will be constructed of steel framework, with 4½-inch brick panels built in; and the total height to the ridge will be about 72 ft. 6 in. A separate steel chimney is to be provided for each setting.

It is intended to draw the gas from each half of the plant through a separate section of the apparatus, so that no alteration to the rest of the works will be necessary. Each of these two sections will be capable of dealing with 1 million cubic feet of gas per day, and one is a duplicate of the other.

The gas is drawn through Clapham water-tube condensers by Waller four-blade exhausters; and it is next passed through a "P. & A." tar-extractor, and afterwards through a Holmes 7 feet diameter washer-scrubber, for the extraction of the cyanogen from the gas by means of the process of the British Cyanides Company. This process consists in washing the gas in a solution of polysulphides of ammonia; this solution being obtained by dissolving free sulphur in the washer. Ammoniacal liquor contains a quantity of ammonium sulphide, which dissolves the free sulphur, forming polysulphides of ammonia. The ammonium polysulphides absorb the cyanogen from the gas as it passes through the washer, with the formation of ammonium sulphocyanide, in which condition it is sold direct to the British Cyanides Company. The gas next passes through two tower scrubbers 7 ft. 6 in. diameter and 42 feet high; and in the bottom of the first one is a Walker tar and carbonic acid extractor. It next passes through the Kirkham washer, to take out the last traces of ammonia, after which it passes to the purifiers. Each section consists of six water-lute boxes 22 ft. by 16 ft. by 4 ft. 6 in. deep; four oxide boxes being used in series, with two oxide catch-boxes.

After passing through the station-meters, the gas flows into holders which have a total capacity of 890,000 cubic feet. A 12-inch diameter pressure main connects these works with the works at Mill Street and Valley Road; and any surplus gas can thus be readily transferred to or from these works. The gas supplied to the district is controlled by one of Cowan's 24-inch governors.

Plans of the plant, with photographs of the alterations in progress and small models of the pits, were on exhibition in the offices.

SCOTTISH JUNIOR GAS ASSOCIATION.

WESTERN DISTRICT.

Visit to the Helensburgh Gas-Works.

The members of the Western District Section of the Scottish Junior Gas Association made their first visit this session last Saturday afternoon, and, appropriately enough, it was to the Helensburgh Gas-Works, as already noticed in the "JOURNAL," where Glover-West vertical retorts have lately been installed. The weather was rather unfavourable; but there was nevertheless a gathering of about 90 members and friends, among them being Mr. A. Kellock, of Pontefract, a former member.

After being received by Mr. W. Blair, the Gas Manager to the Corporation, who briefly explained the construction of the vertical retorts and answered a number of questions respecting them, small parties were formed and conducted over the retorts by him, and also by Mr. Shaw, of West's Gas Improvement Company, the Contractors for the installation. A prolonged and minute inspection of the retorts having been made, and the other parts of the works visited, tea was served in the retort-house.

After tea, the PRESIDENT (Mr. J. M'Ghee, of Glasgow) proposed a hearty vote of thanks to Mr. Blair for his kindness in receiving the members. He expressed the pleasure they had all had in inspecting the vertical retorts, and said how impressed they were with the ease and simplicity with which the coal was carbonized; while the freedom from the nuisance of smoke and steam showed what could be done with modern retort-house practice.

The vote of thanks having been heartily accorded,

Mr. BLAIR said it gave him great pleasure to find so many members of the Association visiting Helensburgh, and seeing for themselves what his Council had done by way of improving and modernizing their works and bringing them right up to date. Gas was introduced into Helensburgh in the year 1844; and the works became the property of the town in 1899, at which time the annual make of gas was 42,962,000 cubic feet, the unaccounted-for gas 20 per cent., and the price 4s. 7d. per 1000 cubic feet. Last year 60,000,000 cubic feet of gas were made, the price charged in the burgh was 2s. 11d., and outside it 3s. 1½d.—prepayment meter supplies being all at 3s. 4d.; and with 50 miles of mains, the unaccounted-for gas was only 6·25 per cent. In the year 1900, the Town Council had a scheme on hand to abandon their almost obsolete works, and to build others near the Craigendoran end of the town. But the residents in the neighbourhood petitioned against the project; and when the matter came before the authorities at Dumbarton, the Council lost the day. Compelled to remain where they were, they set to work to modernize by degrees their antiquated plant; and now everything excepting the condensers was new. The first thing done was to take down a small gasholder and convert the tank into a tar-well, fixing on the top a Holmes brush scrubber of a capacity of 500,000 cubic feet per day. Next a 200,000 cubic feet frame-guided gasholder was erected, and two small holders taken down; one of the tanks being retained for tar and liquor, and the other filled up and included in the coke yard. Subsequently four new purifiers, 20 ft. by 20 ft. by 5 ft. 6 in., a 25,000 cubic feet station meter, and a 30,000 cubic feet rotary exhauster, were erected. Then, after a short interval, a 67 feet single-lift gasholder was taken down and replaced by a three-lift spiral-guided one; giving a total storage capacity of 400,000 cubic feet. It was for a long time seen that something would have to be done in the carbonizing department, as both the retort-bench and the house were entirely worked out—indeed, for the past three winters every retort had been in use, and they were in the unenviable position of having no reserve. He reported to his Committee that new and increased carbonizing plant was necessary. After carefully considering the various systems, and inspecting them in operation at several works, the Glover-West installation, as seen at St. Helens, appeared best suited to his requirements; and this he recommended to his Committee. In due course his recommendation was passed by the full Council; and the visitors had seen what he considered to be the very best thing in carbonizing plant. As to the working results, they continued to give every satisfaction; and he could only refer the members to his paper read before the North British Association at their recent meeting [see "JOURNAL" for Sept. 12, p. 679]. Up to date, the coal carbonized in the vertical retorts had been 1777 tons; the gas made, 14,816,000 cubic feet; and the gas made per ton of coal, 12,587 cubic feet, or 2600 to 2700 cubic feet more than with the horizontal retorts, which ceased working eighteen hours after the verticals were started. Mr. Blair concluded by thanking the visitors for their vote.

The party shortly afterwards left the works, all apparently satisfied with what they had seen and had been told in the course of their visit.

The first meeting of the Industrial Council for settling and shortening labour disputes will be held at the Board of Trade on Thursday. The proceedings will be opened by Mr. Sydney Buxton, the President of the Board of Trade, and will be conducted in private.

USE OF NATURAL GAS IN AMERICA.

The "New York Herald" recently contained, in the Magazine Section, an illustrated article on this subject. It was headed, "Conquest of Natural Gas," which gas, it was said, was "acclaimed as the harbinger of spotless towns and easier living." As there are stated to be 10,000 miles of great pipe-lines conveying this gas to consumers, with enormous extensions in prospect throughout the country, some extracts from the article may be interesting.

The mains carrying the gas vary from 3 inches to 3 feet in diameter, and they convey more than 1000 million cubic feet daily to upwards of 500 cities and villages in various parts of the United States. Even with this large output, it is claimed that the industry is still in its infancy, and that the time is sure to come when practically every important centre of the States will have a constant and unlimited supply of natural gas, or its "first cousin," producer gas, with the result that one of the most important problems of modern domestic and industrial economics—a cheap, clean, and convenient source of light, heat, and power—will be solved. The city of Cincinnati and a score of adjacent municipalities in Ohio and Kentucky are now being supplied with natural gas only. The householder in these cities pays 30c. per 1000 cubic feet, against the old rate of 75c. to $1·25 for ordinary gas; while the manufacturer requiring fuel in large quantities can buy natural gas as cheaply as 10c. per 1000 cubic feet, at which price it costs less than half as much per heat unit as the cheapest water-borne soft coal. There are 165 miles of triple pipe, made to withstand a pressure of 600 lbs. per square inch, carrying the gas from the wells in West Virginia across the mountains, rivers, and valleys of Kentucky and Cincinnati, sending out branches along the route to heat and light other cities.

Cleveland, which is 300 miles from the nearest large natural-gas field, is also supplied by direct pipe-lines—20-inch steel tubes, sealed at the joints with rubber gaskets—running across Eastern Ohio, and carrying on a cold day as much as 200 million cubic feet of gas into the Metropolis of the Lower Lakes. Here, too, natural gas has replaced the manufactured product, though not so completely as in Cincinnati; and the cost has been reduced nearly two-thirds to the smallest consumers. Along the route of the Cleveland gas-lines, built with parallel pipes to ensure a constant supply in case of accident, thirty-two other cities, some of them places with more than 50,000 inhabitants, get their entire gas supply from the same source. Shorter trunk lines, but more of them, supply Pittsburg and twenty or more important Western Pennsylvania cities with natural gas from the West Virginia field. Pittsburg on a cold day uses 300 million cubic feet of natural gas in 24 hours. In this city the gas has been turned to more varied industrial purposes than in any other; while its use for cooking and heating has practically displaced ordinary gas.

In spite of this great drainage of natural gas from the West Virginia fields, only a minute proportion of the available wells are permitted to flow; and those which are now in action show no indications of giving out for half-a-century or more. So apparently unlimited is the supply, that plans are on foot for a pipe-line to Baltimore; the Baltimore Gas Companies having, it is reported, agreed, under certain conditions, to substitute natural gas entirely for that now sent out. The West Virginia gas-fields are the largest in area yet discovered. Covering more than a million acres, including the whole or parts of twenty counties, they extend across the State from north to south, from the foothills of the Blue Ridge to the Ohio River. At any point in this vast area, a well may be bored with the certainty of finding gas at a depth of from 1200 to 3600 feet. Unlike oil, pumps are never needed to extract the gas from the well. On the contrary, the problem engineers have only recently solved—and its solution has given the industry a new start—is how to control the flow of gas. Pressures of 1000 lbs. to the square inch are not uncommon; and the average in the West Virginia field is from 600 lbs. to 700 lbs. Once started, the flow of gas continues almost unabated until the "pocket" is empty. Often a single well will drain an area of thousands of acres of its gas; and until it was discovered that the flow could be checked and regulated, billions of cubic feet of the gas were wasted. In the West Virginia field, stringent State laws and the operations of great corporations who make the supply of natural gas their sole business, have put a check upon waste, though much gas has been burned unnecessarily in the past. As yet, however, there is no limit in sight to the available supply. The single company supplying Cincinnati and Cleveland with gas control 300 acres of gas lands in West Virginia, on which are 92 wells, not half of which are allowed to flow. In fact, less than one-fifth of the total possible volume of gas is now being produced in this field. Two of these wells have a daily flow of 80 million cubic feet; while those that are capped have a daily capacity of 200 million cubic feet. Taking the West Virginia fields as a whole, gas engineers declare that not one-tenth of the available flow is being utilized; while the supply in sight will last, at the present rate of consumption, more than fifty years.

A considerable gas-field in Central Ohio has for a number of years been under development, and now supplies the cities of Columbus, Toledo, and Springfield, as well as many smaller municipalities. Buffalo has had natural gas for many years from the wells of Western New York, controlled by the Standard Oil Company, and from the Canadian field. The first uses of natural gas were, in fact, in Western New York, all of which is so under-

laid with natural gas; and so carefully has it been conserved, that it is a poor farm in any of the south-western counties that has not its own gas well to light and heat the dwelling and stables, run the engine of the threshing-machine, and do other farm work. In the Niagara Peninsula of Canada, this use of natural gas on the farm is also common; and a pipe-line from these Canadian fields runs under the Niagara River to Buffalo. From the Western New York fields natural gas is now being delivered in Syracuse and to many smaller cities lying west of that point. In South-Eastern Kansas and North-Eastern Oklahoma, where the great mid-continent oil-fields are located, there is a plentiful supply of natural gas. A project is under way to pipe this gas to Kansas City and even to St. Louis; and there is said to be an excellent prospect of both these cities being supplied with it in a year or two. The latest of all natural-gas developments in America, and possibly a rival to the West Virginia field, is the discovery of gas in the "Caddo field," in the parish of Caddo, near Shreveport (La.). Here single wells are producing as much as 75 million cubic feet of gas a day. Arrangements have already been made to pipe the gas to New Orleans, 180 miles distant, and to the nearer city of Shreveport; while a plan is on foot to carry it to Dallas (Texas) and to Birmingham (Ala.), 290 miles distant, where its use in the iron and steel industry would be as important as in Pittsburg, where the United States Steel Corporation alone use as much as 65 million cubic feet of natural gas daily.

Thus far only the edge of possible natural-gas developments has been touched, and no one is in a position to say where it will end. The old idea that the natural-gas fields are all bound to exhaust themselves in course of time is being displaced gradually by the opinion, fostered by the geological experts of the United States Government, that the manufacture of natural gas in the bowels of the earth is a continuous process, going on wherever deposits of vegetable and animal matter from the carboniferous era are to be met with in proper conjunction. Wherever oil is found, gas is present; and where oil and coal are found together, it is the belief of some scientists that gas will always be produced in commercial quantities. But even when the natural-gas fields are exhausted—and long before then—the piping of gas direct from Nature's storehouses into greater cities than have yet been touched by the gas-lines is a possibility of the near future. Through the same pipes that now feed Pittsburg, Cleveland, and Cincinnati from the West Virginia fields, producer gas will in time be sent—gas made in huge plants at the fields, from the great veins of commercially unprofitable coal that overlie the gas deposits, and which can be converted into gas at a minimum of expense.

WATER SUPPLY OF THE METROPOLIS.

Eighth Annual Report of the Metropolitan Water Board.

We have received from the Clerk to the Metropolitan Water Board (Mr. A. B. Pilling) a copy of the eighth annual report, dealing with the work of the Board in the year to March 31 last.

The report opens with some explanatory observations on the constitution of the Board, of which the present is the third since its formation under the Metropolis Water Act, 1902. The members met for the first time on June 3, 1910; and they will go out of office on June 1, 1913. At the first meeting, Mr. E. B. Barnard was unanimously re-appointed Chairman and Mr. G. S. Elliott Vice-Chairman for the ensuing three years. The Board held fifteen meetings during the year.

The actual administration of the Board is in the hands of seven Committees—viz., the Appeal and Assessment, Claims, Finance, General Purposes, Law and Parliamentary, Water Examination, and Works and Stores. The number of salaried officers on April 1 was 839, whose salaries amounted to £156,071. The number of workmen and others on weekly wages at the close of the financial year was 3136; and the service staff on weekly wages was 94. The Board granted during the year, under the provisions of the Metropolis Water Act, 1902, 37 superannuation allowances to officers and servants transferred from the late Water Companies; making a total of 354 of such allowances granted since the transfer of the Companies' undertakings to the Board. A superannuation and provident fund for the benefit of the officers and servants came into operation on April 1, 1909, and the number of contributors on March 31 last was 1677; being 458 officers and 1219 servants. At the last-named date, the Board were bearing an annual charge of about £74,350 in respect of superannuations, pensions, and compensation allowances to officers and servants belonging to the Companies.

Turning to the portion of the report dealing with the financial position of the Board, we find that on the 1st of April the capital debt was as follows: "A" Stock £6,060,165, interest £181,805; "B" Stock £35,439,329, interest £1,063,180; redeemable debenture stocks £7,217,838, interest £216,911—total £48,717,332; interest, £1,461,896. In addition to this, the Board are under obligation to pay certain annuities and rent charges (including the Crown "clog" of £400) which amount to £9900; making an annual interest charge of £1,471,796, which is equivalent to 4·3d. per 1000 gallons of water supplied.

From the section of the report furnishing particulars of the sources of supply, we find they continue to be four—viz., the Thames and the Lea, gravel beds adjoining the main stream of the Thames and other gravel beds at Hanworth; natural springs, and wells sunk in the chalk or other strata in the Lea Valley, on the north of the Thames, in Kent, and at certain other points south of the Thames. In the twelve months ended March 31 last, the Thames furnished 58·61 per cent. of the Board's total supply, compared with 58·19 per cent. during the previous year. The daily average quantity gauged at Teddington was 1437·5 million gallons—a decrease of 7·7 million gallons compared with 1909-10. The daily average total abstraction from the river was 136·9 million gallons. The daily average natural flow at Teddington was, therefore, 1574·4 million gallons during the year, compared with 1581·2 million gallons in 1909-10. The total volume abstracted from the river was 49,962·8 million gallons, or 321·6 million gallons more than the preceding year. Compared with that year, there was an increased average daily abstraction from the river of 900,000 gallons last year. Of the 136·9 million gallons daily average quantity abstracted by the Board and the Suburban Companies, the Board drew 134·5 million and the Companies 2·4 million gallons. The percentage of the river's natural flow abstracted by the Board was 8·54, and by the two Suburban Companies 0·15, or 8·69 per cent., compared with the total abstraction of 8·6 per cent. in the year 1909-10. There was an increase of 616,771,331 gallons, or 3·28 per cent., in the total quantity of water abstracted by the Board from the River Lea.

The total volume of water supplied during 1910-11 was 82,170·5 million gallons, compared with 82,365·8 million gallons in 1909-10—a decrease of 195·3 million gallons. The average daily supply was 225·1 million gallons; the figure for 1909-10 being 225·7 million gallons. The southern district took the largest proportion of the total supply—viz., 25·57 per cent.; and the Kent district the smallest—8·92 per cent. The eastern district consumed 20·57 per cent. of the total supply; the New River district, 19·82 per cent.; and the western district, 25·12 per cent. The month of maximum average daily supply was June. The month of minimum average daily supply was January in three districts, February in one district, December in one, and January in general. The difference in the total average daily quantity of water supplied between the maximum and minimum months throughout the area of direct supply was 35·08 million gallons, or a difference of 5·06 gallons per head per day.

The total estimated population supplied by the Board at the close of the year—viz., 7,099,871—is nearly equal to that of the two kingdoms of Norway and Sweden, about the same as the Dominion of Canada, and larger by about a million than the whole population of Scotland and Wales. Within the Administrative County of London, the main increase occurred in the southern district—viz., 9939; and there was a decrease of 2216 in the western district. In the area outside the county, the greatest increase took place in the western district—viz., 12,625; the total increase outside the county being 41,291, or 1·84 per cent. There was a decreased supply of 0·32 gallon per head per day as compared with the preceding year. The average population is estimated to have increased 0·84 per cent., and the average number of services 0·97 per cent. The largest increase per head per day occurred in the eastern district—viz., 0·48 gallon, or 1·69 per cent. The largest decrease was in the southern district—viz., 1·46 gallons, or 4·39 per cent. For the whole area, the average daily supply per head was 31·57 gallons. In 1909-10, the average daily supply per head was 31·89 gallons. Approximately, 55 per cent. of the total population was supplied from the Thames, 24·86 per cent from the Lea, and 19·67 per cent. from wells and springs. The total number of services supplied at the end of the year was 1,097,814—an increase of 9605 over the preceding year. The average daily supply per service was 204·25 gallons, compared with 206·59 gallons; and the highest average population supplied per service was 6·47, against 6·48 in 1909-10. The increase in the number of services on the constant supply during the year was 14,830, or 1·38 per cent. The proportion of supplies on the constant system at the close of the year was 99·23 per cent., compared with 98·74 per cent. in the preceding year. The New River, eastern, and western districts are entirely on constant supply. In the Kent district, the percentage of constant supply is 99·71; in the southern district, 97·12.

In the section of the report dealing with storage, attention is called to the testimony again borne by Dr. Houston, the Board's Director of Water Examination, to its value in improving the quality of water. The effective amount of storage and subsidence reservoir capacity for unfiltered water possessed and in use by the Board at the end of the year was as follows:—

	No.	Area in Acres.	Total Capacity in Million Gallons.
Thames Valley	30	918·50	6345·5
Lea Valley.	17	530·25	2499·2
	47	1448·75	8844·7

The total storage in existence, in course of construction, and authorized but not commenced, is as follows:—

Storage.	Thames. Million Gallons.	Lea. Million Gallons.	Total. Million Gallons.
Existing	6345·5	2499·2	8,844·7*
Constructing . .	1000·0	3000·0	4,000·0
Authorized, but not commenced . .	..	2000·0	2,000·0
Total . .	7345·5	7499·2	14,844·7

* Exclusive of the Hampstead and Highgate ponds, the Camden Park Road reservoir for pond water, and the Cheshunt disused reservoirs—in all, fifteen reservoirs with a total area of 48·25 acres, and a capacity of 68·9 million gallons.

The number of filter-beds is 171, of 170·26 total acreage, or 0·86 acre per million gallons average daily supply of filtered water;

'St. Nicholas' Fires

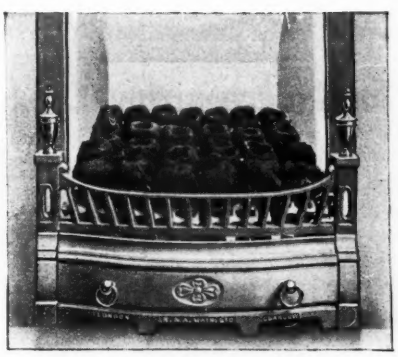
"MARK II." SERIES.

WE were the first Gas Fire Makers to recognize that the open fireplace was

A BRITISH INSTITUTION;

and we therefore designed the now familiar "ST. NICHOLAS" Interior Fitting for converting a coal interior into an artistic, novel and efficient Gas-Fire.

Two years' experience of its working enables us to effect some improvements and refinements which are embodied in our new "MARK II." SERIES.



The "St. Nicholas."

A FEW FEATURES.

The burner and gas fittings are invisible, and it looks just like a cheerful glowing coal or coke fire.

It is only necessary to remove the front bars of the existing coal grate. There is no necessity to remove the bottom bars as in the case of other inset fires.

It fits any grate. The fuel is telescopic and can be lengthened or shortened at will

It appeals to consumers who are prejudiced against the ordinary Gas Fire.

Here is a development of the "ST. NICHOLAS"

The "SANTA CLAUS"

which is a "ST. NICHOLAS" Fire in a self-setting frame.

The "Santa Claus."

Put these fires on your hire list and you will be surprised and pleased at the result.

R. & A. MAIN, LIMITED,

WORKS: Gothic Works, EDMONTON, N.; Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.

SHOW-ROOMS AND BRANCHES: 25, Princes St., Oxford Circus, W.; 136, Renfield St., GLASGOW; 56, Broad St., BIRMINGHAM; 83, Old Market St., BRISTOL; 13, Whitworth St. West, MANCHESTER; 8, Exchange Place, Donegall St., BELFAST; 333, Queen St., MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

DESSAU VERTICALS.

Adopted all over the World.

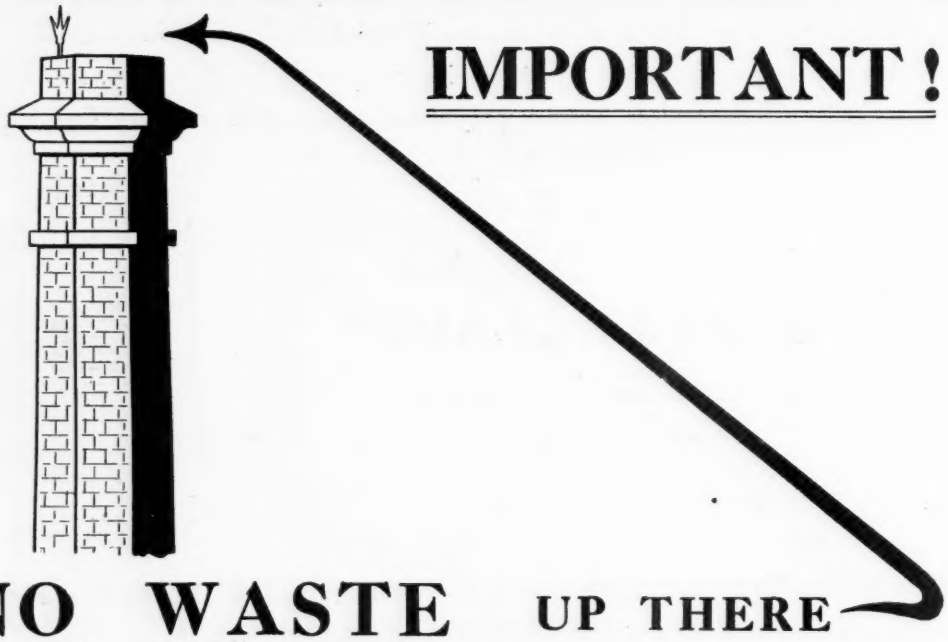
Total Carbonizing Capacity over 81 million cubic feet per diem.

Total Installations to date - 86.

FOR FULL LIST OF INSTALLATIONS, SEE INSTITUTION NUMBER OF "JOURNAL."

THE VERTICAL GAS RETORT SYNDICATE, LTD.,

17, Victoria Street, Westminster, S.W.



IMPORTANT!

NO WASTE UP THERE

WITH

BROOKE'S PATENT REGENERATORS.

SOLE AGENTS: **ROBERT DEMPSTER & SONS, LTD.,**

ELLAND.

ILLUSTRATIONS & DESCRIPTIVE SPECIFICATION WILL BE SENT ON APPLICATION.

the latter figure ranging from 0·61 acre in the New River district to 1·01 acres in the western district. The average monthly rate of filtration per square foot per hour during the year varied from 0·82 gallon in the Grand Junction district to 2·10 gallons through the Kempton Park beds of the New River district. At Long Ditton (southern district), a group of six filter-beds, of 7½ acres total area, was completed during the year. Two were finished and brought into use in June, 1909; and three, of 1¼ acres each, in April, 1910. In the New River district, 4¾ acres of filter-beds are contemplated at Hornsey. The total number of service reservoirs for filtered water (as distinct from storage reservoirs for raw water) is eighty, of 311·072 million gallons total capacity. Only two, situated at Hanger Hill, Ealing, of 53 million gallons capacity, are uncovered.

The following figures show the increases which have taken place under the Board in the active equipment of water-works since the transfer of the undertakings:

	Before June, 1904.	At March 31, 1911.
Storage reservoirs for unfiltered water	57	62
Acreage of ditto	886	1497
Capacity of ditto in million gallons	4077·6	8913·6
Service reservoirs for filtered water	74	80
Capacity of ditto in million gallons	241·5	311·1
Filter-beds	137	171
Acreage of ditto	140	170·3
Engines	235	264
Horse power of ditto	32,177	38,380
Miles of water-pipes	5,759	6,307

In the section of the report which treats of the miscellaneous work of the Board, the proceedings in Parliament are first dealt with; the Water Supplies Protection Bill coming in for a good deal of attention. The important work of the Director of Water Examination (Dr. Houston) is reviewed at some length; and other matters touched upon are the rainfall records furnished to the Board by Dr. H. R. Mill, the uniform scale of charges, &c. The total rateable value of the Board's properties (including the mains) is £1,191,655, distributed as follows: Bucks, £791; Essex, £77,708; Herts, £17,566; Kent, £30,372; London, £635,144; Middlesex, £287,306; Surrey, £142,768. It is stated that the assessment of the Board's works in certain parishes represents as much as 77·2, 73·5, and 69·2 per cent. of the total rateable value of the parishes.

The report concludes with some observations on the future water supply of the Metropolis. Particulars are given of the proceedings which led up to the promotion of the Board's New Works Bill of the recent session, for the construction of a series of reservoirs in the Thames Valley, in the vicinity of those at Staines. As already recorded in the "JOURNAL," the Bill met with considerable opposition; and though it eventually received the Royal Assent, its scope was greatly restricted. The promotion of the Bill involved a review of the conditions under which the Board are entitled to abstract water from the Thames.

Accompanying the report are appendices containing a collection of tabulated statistics, Dr. Mill's report on the rainfall in the Thames and Lea Valleys, and a list of the works authorized and the progress made with them during the year.

Gas and Other Motive Power for Mill Driving.

Members of the Textile Mill Driving Joint Committee met at the Textile Institute Rooms, Manchester, on Friday last and approved a report prepared by a Special Sub-Committee indicating how the proposed investigation into the relative forms of mill-driving should be carried out. The Committee includes members accustomed to steam-engines, gas-engines, turbines, and gas-producing plants, as well as electric driving; and every form of motive power will have due consideration. For the purposes of the investigation, the textile industry has been divided into five sections—viz., cotton, woollen and worsted, linen, silks, hemp and jute; and special Sub-Committees were selected to deal with each section. Another Sub-Committee was appointed to carry on investigations outside the United Kingdom. Mr. Thos. Roberts, of Darwen, who presided at the meeting, said that the investigations would be of an exhaustive character, and would occupy a considerable time. One object of the investigations is to discover whether there is any justification for the belief that electrical driving is making greater progress outside the United Kingdom than inside. At the same time, attention will be paid to the reciprocating steam-engines and steam-turbines and boilers on the one hand, and oil and gas producing plant on the other.

Midland Association of Gas Managers.—As already announced in the "JOURNAL," the autumn meeting of the Association will be held in Birmingham on Thursday. According to the circular issued by the Hon. Secretary (Mr. Harold E. Copp, of West Bromwich), the members will assemble at the Grand Hotel, where, under the presidency of Mr. J. H. Brown, of Nottingham, the only items of business on the *agenda*—the election of officers and new members—will be disposed of. At the close of the meeting, the members will visit the University, where they will be received by Professor Burstall, M.A. (Chance Professor of Mechanical Engineering), who will conduct them over the buildings. A visit will also be paid to the power station, containing large gas and oil engines, which will be at work, as well as the Mond gas plant, boiler-house, and other steam auxiliary machinery.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

The "Engineering Correspondent" of the "Daily Telegraph" Consents.

SIR,—I have read your remarks on my reply in the issue of the "Daily Telegraph" of last Monday.

In order that there may be no misapprehension in the minds of your readers, I may at once say that I propose to accept the hospitality of your columns, as you suggest.

I make this statement on the understanding—

(1) That you will print my article as sent to you.
(2) That all correspondence on articles from me appearing in your "JOURNAL" will be paid for at your usual contributors' rates.
(3) That you will refrain from editorial comment until the next issue of publication.
(4) That you will print the article within fourteen days of its receipt.

Let me say, at once, that my sole object in doing this is to get at the exact truth. If you or your readers can provide reliable evidence to refute my statements, I will certainly avail myself of their figures.

THE ENGINEERING CORRESPONDENT OF THE "DAILY TELEGRAPH."

Oct. 21, 1911.

[Willingly, we consent to the conditions imposed by our correspondent, with the reservation in connection with the first one that, if anything is included in the article that might bring the "JOURNAL" into collision with third parties—such as through personal references, or comment upon matters that are the subject of contract—we shall have the right to delete or amend such matters, in consultation with our correspondent. In view of his knowledge of journalism, and its responsibilities, we do not anticipate there will be any dispute as to the propriety, from the point of view we have in mind, of any of his statements. We will also, at his desire, refrain from public editorial comment for a week after the appearance of his article, though we entirely fail to see the object of this reservation. In order, too, that controversy may not rove over too wide a field, we will ask our correspondent to confine his communication to those matters that were treated upon in his articles, and to which exception was taken, or upon which definite information was asked of him. And now for the justification of the statements made, which we regard as unfair and detrimental to the interests of the gas industry, in the recent articles appearing in the "Daily Telegraph." When the article appears, we have no doubt that many of our readers will supply, through our columns, from their own personal experiences, facts and figures (in addition to those we may be able to give) of which our correspondent will be able to subsequently make good and full use in the columns of our morning contemporary. —ED. J.G.L.]

Position of the Dessau Vertical Retort.

SIR,—The information asked for by "R.W.E.." in last Tuesday's issue, as to fuel consumption in the Dessau and Glover-West retort-settings, would have been included by me in the last table in the articles, if it had been available in a satisfactory form for many of the trials, &c., quoted. But it was often not given in the original reports, or else was given without regard to ash or moisture. I am, however, going over the originals again; and if I get sufficient figures on a comparative basis I will send a supplementary note in answer to this part of "R.W.E.'s" letter. I do not think the rest of it needs any special answer from me.

THE WRITER OF THE ARTICLES.

Oct. 21, 1911.

Gas Supply of Napier, New Zealand.

SIR,—In the "JOURNAL" for June 27, p. 1026, there appeared an article on the "Wanganui Gas Supply" (comparing the undertaking with that of Napier), which stated that the profit last year at Napier was £5646, or equal to 7·65 per cent. for the capital employed.

I desire that you will publish a correction of this statement, as unfortunately an error has been made in compiling the information contained in same. The amount of the profit £5646, was for the last half-year's working only, and not for the full year, as mentioned in the article in question.

As this incorrect statement is a reflection on the management of the Napier Gas Company, I am directed to express regret that it should have been made, which was entirely due to an error by us in extracting the figures from the balance-sheet of the Napier Gas Company.

G. MURCH, Town Clerk.

Wanganui, N.Z., Sept. 7, 1911.

[The correction to which our correspondent calls attention was already made in a letter from Mr. Charles H. Edwards, the Manager of the Napier (N.Z.) Gas-Works, which appeared in our issue for the 3rd inst., p. 51.—ED. J.G.L.]

The Education Committee of the Exeter Town Council report the receipt of a letter from the Exeter Gas Company to the effect that they have made arrangements for eleven boys to attend one of the evening continuation schools. The fees have been paid by the Company; and if the boys make the requisite number of attendances, they will be allowed to keep the amount themselves. The Committee express their high appreciation of the enlightened action of the Company.

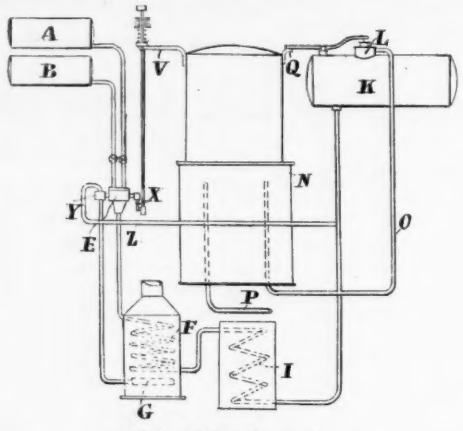
REGISTER OF PATENTS.

Generating Gas from Steam and Combustibles.

ROBERTS, F. & M. P., of Nottingham.

No. 21,391; Sept. 14, 1910.

In their patent No. 12,829 of 1908, the inventors proposed to generate a gaseous mixture or combination which would combust immediately it is brought into contact with a flame or ignition spark, without the addition of air. The object of the present invention is to obtain a gaseous combustible which, however, is not explosive, but which will only burn in the atmosphere, or with the addition of air, and can be stored for long periods of time without condensing; so that it may be used for incandescent or other gas lighting, heating, or other like purposes in a similar manner to ordinary town gas.



Roberts' Gas-Generator.

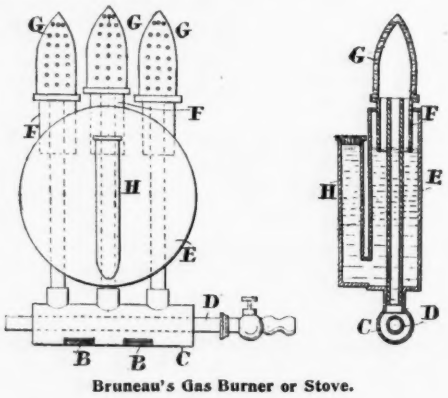
Water and (say) petroleum oil are to be stored in separate tanks A, B, arranged at such a height as to give the necessary head. Pipes lead the water and oil to a cock E, whence the mixture passes to a flash generator in the form of a coil F, which is maintained at a temperature higher than 700° C. by a burner G, supplied with gas from the storage tank. When the mixture enters the coil, it is "flashed into the gaseous state and forms a permanent combination," which is led to a cooler I, and thence to a gas pressure storage tank K. The latter is fitted with a reducing valve L, controlled by the bell of a gasholder N, with which the casing of the valve is also connected by a pipe O. A pipe P leads gas to the mains for use for illuminating, heating, or power purposes. The valve L is controlled through the medium of a tappet Q, which, when the holder rises to a predetermined level, raises one end of a pivoted lever, and thereby depresses and closes the valve. Another tappet V is adapted to strike a collar connected to a crank X, on the stem of the cock E, so that the supply of mixture to the generator can also be controlled by the gasholder. Similarly, by extending the stem of the cock to operate a cock Y for the gas to the burner, the latter may also be controlled. The gas for the burner is obtained by a bye-pass connection Z. Valves are fitted to enable the proportion of the supplies of water and oil to be regulated.

Gas Burner or Stove.

BRUNEAU, G., of Clichy, France.

No. 22,759; Oct. 1, 1910.

The object of this invention is said to be "to provide a domestic heating apparatus, in which hydrocarbon gases (particularly coal gas) are burned, so that steam will be produced by heat radiation from the burner; said steam being decomposed in the vicinity of the flame—the hydrogen of the dissociated gases and the oxygen serving to create a flame of very high temperature."



Bruneau's Gas Burner or Stove.

As shown, three pipes or tubes are connected at their lower ends to, and open into, a casing or tube C, provided with air-inlet openings B. Passing through and enclosed by the casing is a gas-duct D. The upright pipes are enclosed by a metallic vessel E, and each pipe terminates within a socket F. The sockets are each arranged to support a nozzle G, which is made incandescent for heating purposes. A pipe H connects with the vessel E at a point in the lower part of one of the side walls, and is disposed approximately parallel to the sides of the vessel. The pipe permits the introduction of water into the receptacle to the level indicated. When the burner is in operation, the pipe is closed by means of a cap at its upper and free end, with perforations formed so that steam from the water within the casing may be liberated in small quantities.

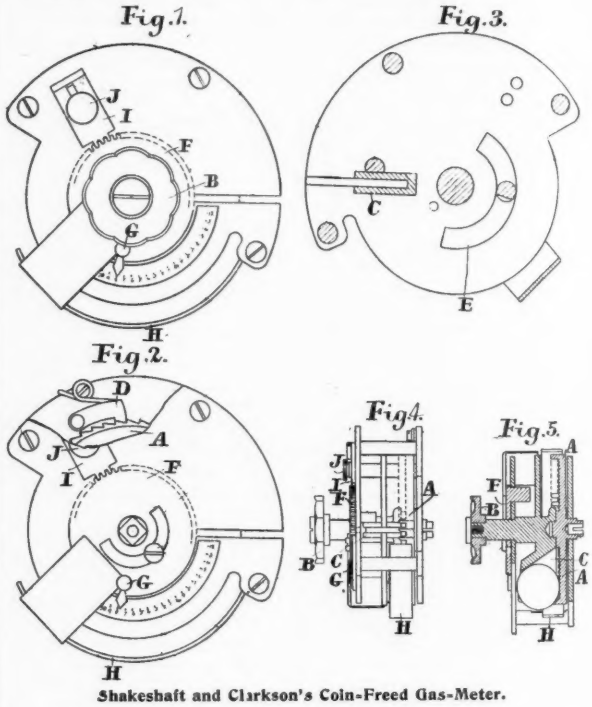
When in use, the vessel E and pipe H are filled with water to about the level indicated; gas being permitted to flow into the pipe D. The gas and air mixture sucked through the openings B, on being lighted, renders the nozzles G incandescent; and the water contained in the vessel E thus becomes heated to the extent that steam is slowly disengaged, and passing out through the perforations comes in contact with the nozzles G. It is thus decomposed into its elements, "the oxygen serving to assist combustion, and the hydrogen burning with the gas, whereby a great increase in the heat of the flame is obtained."

Coin-Freed Gas-Meters.

SHAKESHAFT, C. E. M., and CLARKSON, T. J. R., of Aston, Birmingham.

No. 22,168; Sept. 24, 1910.

This invention refers to the type of coin-freed gas-meter in which a ratchet-wheel is adapted to be rotated when a connection is established by means of a coin between the wheel and a controlling handle for the purpose of imparting a predetermined movement to the valve; also to meters which are provided with a stop for limiting the movement of the coin-carrier, and to those which are provided with means for locking the stop in the desired position. Such a meter is shown in patent No. 24,292 of 1909.



Shakeshaft and Clarkson's Coin-Freed Gas-Meter.

Fig. 1 is a front elevation of the controlling device. Fig. 2 is a similar view (with the controlling handle removed) showing the means of locking the disc, while part of the mechanism is broken away to show the pawl. Fig. 3 is a sectional view; fig. 4, an end view; fig. 5, a sectional view showing the coin in position.

The device consists of two plates clamped together by screws. The ratchet-wheel A is journalled in one of the plates, and has a projecting nose adapted to engage a valve-controlling device, such as that shown in the 1909 specification. Journalled within the other plate is a spindle or shaft having a controlling handle B and supporting a coin-carrier C, consisting of two metal discs between which the coin is inserted. The two discs are placed in a radial slot in another large disc disposed around the spindle; the periphery of the disc serving to prevent the insertion of a coin into the mechanism except at the proper position.

The ratchet-wheel A has a series of teeth around its periphery, and in engagement with the teeth is a spring actuated pawl D, which prevents the backward rotation of the ratchet-wheel. There is a guide into which the coin is inserted, and by which it is passed to the coin-carrier; the coin being of such a size that it engages the notches on the front face of the ratchet-wheel, so that if the handle is turned when the coin is in engagement with the ratchet-wheel, the wheel will be rotated to open the valve.

In one of the plates is an annular slot E, while on the outside of the plate is a disc F having a projection or stop passing through the annular slot so as to limit the extent to which the coin-carrier may be rotated. A fixed stop adjacent to the slot in the plate limits the return movement of the coin-carrier. The disc F has an annular slot engaged by a set-screw in the plate, which retains the two parts in contact and also serves to lock the two parts in the desired relative positions. If, now, the disc is rotated, the stop will be moved in the annular slot and regu-

late the amount of valve-opening caused by a single stroke or full rotation of the handle.

The disc F is provided with a pointer G, working over an indicating dial so divided as to show the number of cubic feet of gas which would be given to the consumer if the disc is rotated to bring its pointer opposite to one of the indicating figures. Thus, if the pointer is opposite to 28, then 28 cubic feet of gas will be supplied every time a coin is inserted and the mechanism operated, if the disc and stop are shifted to bring the pointer opposite to this figure.

Secured to the disc is a shield H, which retains the coin in engagement with the ratchet-wheel until it has reached the end of its travel, and thus assures the complete rotation of the ratchet.

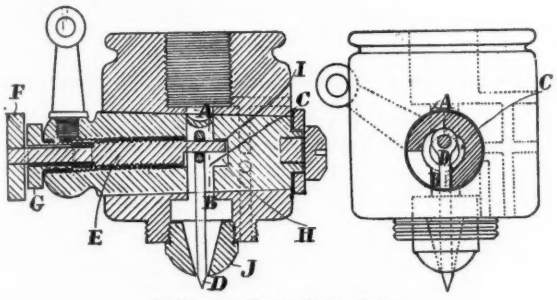
To prevent any accidental movement of the stop and its disc, the disc has cut around its periphery a series of teeth engaged by corresponding teeth on the end of a radially-moving locking bolt I, which has a radial slot engaged by a locking screw J whereby the bolt may be retained in engagement with the disc, and so the rotation of the disc is absolutely prevented.

Combined Gas Tap and Self-Cleaning Regulator.

JUDD, G. H., of Sheringham.

No. 29,624; Dec. 21, 1910.

This invention refers to taps in which the passage of the gas is controlled by means of a needle valve capable of adjustment. The object aimed at is to provide for the needle being adjusted with respect to its seat from within the plug itself.



Judd's Gas Tap and Regulator.

The invention is shown as applied to a bye-pass tap of common form. The plug of the tap is hollow, and is provided with a screw-thread designed to engage a thread formed upon the exterior of a pin E, which (at its inner end) has a projection I eccentrically disposed relatively to the axis of the pin. The projection is disposed within a chamber C, one side of which is recessed at H so as to permit the revolution of the end of the pin either when adjusting the aperture or when the plug is turned. At the same time the wall of the chamber C prevents the disconnection of the eye formed upon the inner end of the needle D, and which eye is engaged by the extension on the pin. The needle passes through the chamber C and through a perforation in a plug J through which the gas passes to the burner. The pin E may be rotated independently of the plug of the tap; and in order to secure it after adjustment, upon the pin there is a lock nut G, which has an exterior screw-thread which engages the thread in the plug of the tap. The passage through which the needle D passes (as also the aperture in the plug) is shaped so as to permit the lateral movement of the needle. When the plug is in the position shown, the passage for the gas is open for the desired amount of gas. Should it, however, be desired to vary the amount of gas passing at this time, the pin E is rotated, and the needle inserted or withdrawn more or less from the aperture in the plug, after which the pin is locked. When the plug is turned to open or close the tap, the needle is moved longitudinally, and so frees the aperture in the plug from any matter collected there.

Recovery of Bye-Products formed during the Gasification of Coal.

COKE-OVEN CONSTRUCTION COMPANY, and MARR, J., of Sheffield.

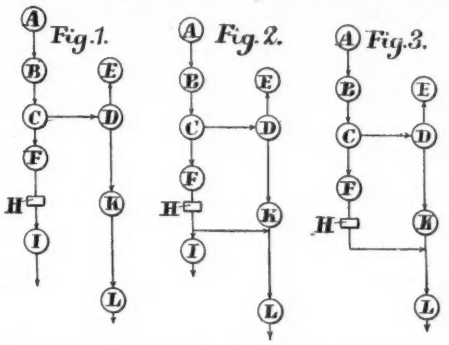
No. 29,935; Dec. 23, 1910.

This invention relates to the recovery of bye-products from the gases evolved during the dry distillation or gasification of coal, and in particular for the recovery of tar, ammonia, and benzol; its chief object being to avoid entirely the production of any effluent or waste liquor. After the crude gas has been cooled to such a point that the whole of the tar and practically all the moisture have been removed, and after the separation of the tar from the ammoniacal liquors, the whole of the latter are evaporated to dryness and are in their entirety carried (in the form of vapours) to a saturator for the direct formation of sulphate of ammonia—the waste vapours being discharged into the air.

In carrying out the process, the crude gases are cooled to such a temperature (about 15° to 35° C) that the tar is entirely eliminated, also as much of the water vapours as is consistent with the cooling of the gases in order to recover the tar (or benzol when desired, in which case the gases are scrubbed for benzol in any suitable medium). The gases, stripped of nearly all the water vapours, thereafter pass direct, without re-heating, and without scrubbing with water for ammonia, into a saturator, where they bubble through, or are washed with, a sulphuric acid lye, by which the ammonia is fixed as sulphate of ammonia, which is ejected from the apparatus from time to time as formed. The gases leaving the saturator are free from moisture, and may be then delivered direct to the point of consumption. The rest of the ammonia derived from the crude gases is carried by the water vapours thrown down in the cooling of the gases.

After treatment for the separation of tar, the whole of the condensate is evaporated to dryness in extraneous apparatus; waste heat or the like being used for the purpose. The vapours generated in this way are passed direct into a saturator similar to that in which the gases are treated; the temperature of the vapours being maintained at such a point as to avoid condensation. The vapours, having thus been stripped of their ammonia, may then be ejected into the atmosphere, whereby the production of any waste liquor or effluent is avoided.

It is, of course, a well-known practice, the patentees remark, to add ammonia vapours to the gases before the saturator. For instance, it has been proposed to add the ammonia vapours from a distillation column to the gases before the saturators. These vapours represent a very small proportion of the total condensate treated in the column, leaving the bulk to appear as a waste liquor or effluent as already explained. According to the present invention, the whole of the ammonia liquors, condensed from the crude gases, are revaporized to dryness by extraneous means, and the passage of these vapours through the same saturator as the whole or a part of the gas "provides a convenient and economical means of getting rid of the vapours."



Diagrams to Illustrate Bye-Products Recovery Plant.

The accompanying diagrams show some of the ways of carrying out the process in accordance with the present invention.

Fig. 1 represents that form of the process in which coke-oven gases and vaporized ammonia liquors are treated in separate saturators—the former being carried to their point of consumption, while the waste vapours from the latter are discharged into the atmosphere. Fig. 2 represents the form of the process in which part of the gases are passed direct to a saturator, while the remainder is diverted to the saturator in which the vaporized ammonia liquor is treated. The gases from each saturator are then carried to their respective points of consumption. Fig. 3 is similar to fig. 2, except that the first-named saturator is dispensed with and the whole of the gases are passed with vaporized ammonia liquor through a common saturator and thence to a common point of consumption.

A represents the coke-ovens or retorts; B, the hydraulic main; C, the condensers and tar-extractors, which remove the tar and ammonia vapours from the crude gas; D, the apparatus for separating the tar from the ammonia liquor; E, the tar-tank; F, a scrubber for the recovery of benzol; H, an exhauster; I, saturator for the recovery of ammonia from the gas; K, vaporizer for the ammonia liquor; L, saturator for the recovery of ammonia from the vaporized ammonia liquors.

In all forms of the process the gases entering the condensers C are cooled to such a temperature (15° to 35° C.) as will ensure the removal of all the tar therefrom. This will also remove practically all the water vapour, and leave the gas to all intents and purposes dry. In fig. 1 form of the process, the ammonia liquor separated from the gas at C is kept separate during the remainder of the process. In the forms shown in figs. 2 and 3, the gas and liquor separated at C are kept separate only up to a point immediately prior to the last saturator. At such point, according to fig. 2, a part of the gas is united with the vaporized ammonia liquors and passes through the saturator L; while the remainder is passed cool and practically dry to the saturator I. According to fig. 3, the whole of the gas is united with the vaporized ammonia liquors and passed through the saturator L.

Manufacturing Ammonium Sulphite and Ammonium Sulphate from Gases.

WOLF, F., of Bochum, Germany.

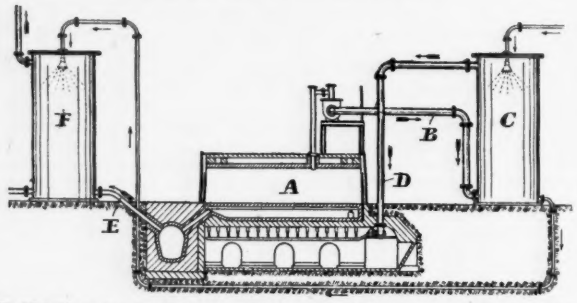
No. 2042; Jan. 26, 1911.

One of the main features of the utilization of coal bye-products is, the patentee mentions, the conversion of the sulphur in the products of distillation into sulphuric acid, with a view to reaction with the ammonia also contained in the coal, to produce ammonium sulphate. This has been done by conducting the distillation gases of the coal through gas-purifying apparatus containing oxide of iron, and then converting the sulphur thus obtained into sulphuric acid, by treatment of the purifying substance in roasting ovens. The sulphuric acid is then used in a further process to react with ammonia gas for producing ammonium sulphate.

Recently, however, it has also been proposed to subject coal gases containing sulphur in the form of sulphuretted hydrogen to oxidation by means of a catalytic process, and thus to directly obtain ammonium sulphite and ammonium sulphate. It has also been proposed to separate ammonia from the gas in a saturator; burn the gas; and then pass the products of combustion (including sulphurous acid) through a scrubber in contact with a continuously circulating stream of the ammoniacal liquor, passing alternately through the scrubber and through the saturator.

According to his present invention, the gases are also to be burnt, after separation of the ammonia, and are then passed through a scrubber

in contact with ammoniacal liquor; but he does not use a continuously circulating stream of washing liquid, but continuously renews the supply of washing liquid. This process is said to be quite effective, and much more simple than that in which a circulating stream of washing liquid is used, in that it dispenses with the saturator and with the exhausters, coolers, drying apparatus, and much of the pumping machinery required in the prior process referred to.



Wolf's Plant for Producing Ammonium Sulphite or Ammonium Sulphate.

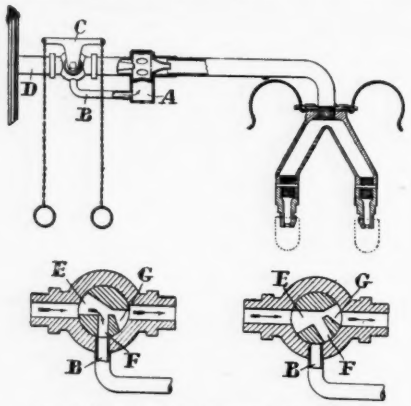
Apparatus suitable for carrying out the invention is shown. In it the gases from the hydraulic main pass over the oven A, freed from tar, and conducted through the pipe B to the ammonia washer C, wherein the ammonia is washed out by a shower of water. The gases then pass through the pipe D, and are burnt in the oven flues, with all the sulphur originally present. The products of combustion pass through the pipe E into the tower F, through which they ascend against a shower of ammoniacal liquor from the washer C. The washed gas is discharged at the top to the chimney; and the liquor containing ammonia sulphite and ammonia sulphate is taken from the lower part of the tower for use or further treatment.

Incandescent Gas Lighting and Heating.

Cuss, C. T., of Swindon.

No. 4708; Feb. 24, 1911. Ante-dated, Sept. 10, 1910.

This invention has for its object to avoid shock to the mantles on the ignition and the extinguishing of the burners, and so to prolong the life of the mantles employed. The proposal is to light or extinguish a cluster of inverted burners, without shock, by supplying to them a rich mixture at the time of ignition and extinction by admitting an additional gas supply to the burners, and which additional gas is completely cut off after the normal gas supply is turned on.



Cuss's Incandescent Burner Arrangement.

In the form illustrated, the burners are attached to a wall bracket. The chamber A surrounds the bunsen, and is supplied with extra gas by the pipe B. This extra gas has the effect of ensuring that a strong mixture shall pass to the burners when igniting or extinguishing the light for a short period after ignition and before extinction. The gas is controlled by an overhung lever C, which keeps the normal gas supply turned full on or right off The "hollow" cock is provided with two gas-ways—one the main or ordinary supply to the burners, the other providing the extra gas required, which passes by the tube B to the chamber A. On this gas-way a groove is provided in the plug or body of the cock to ensure that the extra gas shall be passing for the full period of time required, but shall be completely cut off when the gas is extinguished or ignited. On first turning the cock from the off position, gas passes from D, through the widened groove E, and through the passage F, in the plug to the pipe B. On further movement of the plug, the gas is admitted by the normal passage G through the plug, and (after the gas is fully turned on) the further movement of the plug cuts off communication between the passage F and the pipe B. The cock is operated by a moderately slow motion by the chains shown. The normal air supply in this case passes upwards into the chamber A surrounding the bunsen through apertures in the bottom of it.

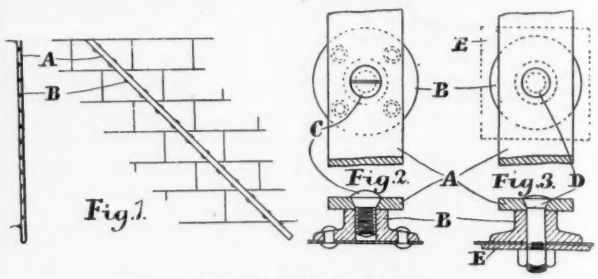
Spirally-Guided Gasholders.

Barker, J., of Leven, N.B.

No. 14,548; June 20, 1911.

This invention relates to fixing spirals to spirally-guided gasholders so that the guides are not in direct contact with the holder and clear of any riveted joints.

Fig. 1 is a face view and side elevation of part of a holder showing



Barker's Spiral Guides for Gasholders.

a spiral guide. Figs. 2 and 3 are sections and plans of the guide and its supports, showing alternative methods of fixing.

Each spiral guide consists preferably of a plain rectangular bar A or of a specially rolled flat with projections on one or both sides to give strength; the guides being kept away from the side of the holder by distance-pieces B. Each guide is fixed in position by screws C or by bolts D. Where screws are used, the distance-pieces may be riveted to the holder; but with bolts, the distance-pieces need not be fixed by rivets—the bolt securing both the guide and the distance-piece. When bolts are used, a washer E of considerable area is employed.

By using spiral guides of the kind referred to, the construction of small or medium-sized holders can be very much simplified, the patentee claims, as the sheets can be of equal size, and the distance-pieces can be placed where desired and entirely clear of any riveted joints.

LEGAL INTELLIGENCE.

LIVERPOOL WATER-WORKS ASSESSMENT APPEAL.

In the Court of Appeal, on Monday last week, before Lords Justices Vaughan Williams, Buckley, and Kennedy, an appeal was opened from the decision of the Divisional Court, on the 25th of January last, with regard to the liability of the Liverpool Corporation to be rated in respect of part of the gathering-ground of the Rivington reservoirs—viz., 1165 acres out of a total of some 10,000 acres belonging to them—which lies within the district of the Chorley Union. [See "Journal," Vol. CXIII., p. 537.] A certain portion—viz., 859 acres—is practically a grouse moor, the shooting rights over which are let, the shooting tenant being rated in respect of them; and the Corporation contended that they did not occupy this land so as to make them liable to be rated. An area of 297½ acres was separately enclosed, and used as a plantation, and a further 8½ acres as a nursery ground; and these two areas were assessed at 2s. and 15s. per acre respectively, under section 4 of the Rating Act, 1874. But the respondents (the Chorley Union and the Overseers of the Parish of Withnell) claimed to rate it at £1 per acre in addition, as part of the gathering-ground. On this point the Divisional Court decided in favour of the Corporation; but on the first point, as to the rateability of the whole gathering-ground, in favour of the respondents.

Mr. Balfour Browne, K.C., Mr. Macmorran, K.C., and Mr. Oulton appeared on behalf of the Corporation; Mr. Danckwerts, K.C., Mr. Ryde, K.C., and Mr. Hewitt represented the Chorley Union.

The arguments in favour of appellants occupied the whole of Monday. On Tuesday, in the absence of Mr. Danckwerts through illness, Mr. Ryde argued the case for the respondents; and the further hearing was adjourned to give Mr. Danckwerts an opportunity of being heard.

Theft from a Gas Company.

At the Essex Sessions at Chelmsford, Thomas Lake, labourer, and Percy Anderson, engine driver, were indicted for stealing 14 cwt. of pig lead from the Ilford Gas Company. It appeared that Lake was an employee at the gas-works. His garden was at the rear of the works, and near the store-room where the lead was kept. When the lead was missed, detective officers visited both prisoners. They at first denied all knowledge of it; but when seen again the next day, Lake made a statement, in which he said he only received 4s. for what he did, that if had not been for drink this would not have happened, and that he hoped the officer would do what he could for him. The other prisoner subsequently admitted to a detective that he assisted to get the lead out of the store-room, and, before the Magistrates, pleaded guilty. On an examination of Lake's garden, there were found to be indentations, as if heavy pieces of something had been thrown on the ground. The Jury found the prisoners guilty, but expressed the opinion that they were not the principals. It was stated that drink was the cause of the downfall of both men; and they were sentenced to two months' hard labour.

Cowdenbeath Gas Company's Shares.

In the Second Division of the Court of Session on Tuesday last, a reclaiming note was lodged on behalf of the defender in the action by Alexander Waddell, gas engineer, of Dunfermline, and another, against James Hutton, of Edinburgh. The pursuers sued for £1010 as due in respect of shares in the Cowdenbeath Gas Company, Limited, of which the defender was Chairman, and which they maintained should have been allocated to them. In August last, Lord Ormidale gave decree in favour of pursuers for £757 10s., with expenses [see "Journal," Vol. CXV., p. 488]; and it is this decision which is brought under review.

MISCELLANEOUS NEWS.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

Half-Yearly Report.

The following is the report of the Directors of the Association for the six months ended the 30th of June, which, with the accounts for this period, will be submitted to the proprietors on the 7th prox.

The profit of the half year was £281,767, which, together with the sum of £26,278 brought forward from the account of the previous half year, makes a total of £308,045 available for appropriation, as compared with £278,847 for the corresponding period of 1910.

In continuance of the policy adopted at the half-yearly general meeting of Nov. 1, 1910, of writing-down to their market value the 2½ per cent. Consols which represent the reserve fund, a further sum of £20,000 has been charged against the revenue of the half year under review for this purpose.

The total output of gas in the various towns directly supplied by the Association showed an increase of 6·57 per cent., and the number of consumers increased by 7·86 per cent.

The total number of meters in use at the close of the half year was 550,447, of which 145,008, or 26·34 per cent., were prepayment meters. At the end of June, 1910, the total number of meters was 508,845, of which 130,986, or 25·74 per cent., were prepayment meters.

The total length of mains laid up to the 30th of June last was 2421 miles—an increase of 58½ miles since Dec. 31, 1910.

The plant and mains at all the stations were maintained in an efficient condition.

The quantity of coal carbonized in the half year under review was 509,860 tons, of which the average gross cost was 17s 11·22d. per ton or 3·25d. per ton less than in the corresponding half year.

The value of coke again receded in the half year under review; but tar values were better, and ammoniacal liquor values improved considerably.

At Antwerp, contracts were concluded with the suburban communes of Hoevenen, Schilde, and Stabroeck, securing to the Association the monopoly of the supply of gas until 1935.

Owing to the growth of the business at this station, the accommodation provided for the staff fourteen years ago in the offices at No. 58, Place de Meir, had become inadequate, and a commencement was made in the course of the half year under review with structural alterations, intended to improve and enlarge these offices.

At Berlin, the enlargement of the apparatus house on the Mariendorf works was completed; and progress was made with the erection of a new bench of vertical retorts. The Association's agreement with the Municipality of Berlin in regard to the price of gas, which has been in force since 1901, was prolonged for a period of thirteen years (until 1924).

At Brussels, the tank for the new 100,000 cubic metre (3½ million cubic feet) gasholder on the Forest works was completed, and progress was made with the erection of the holder. The construction of twelve settings, each of ten vertical retorts, was also put in hand on these works. The electricity station at Droogenbosch was completed and put in action.

As a result of the 45 years' prolongation of contract which the Association concluded in 1905 with the municipal authorities of Linden, an industrial town adjoining the city of Hanover, but on the opposite bank of the River Leine, new works have become necessary; and in the course of the half year under review a commencement was accordingly made with the erection of gas-works, situated on land acquired for the purpose within the territory of the town of Linden.

A contract, securing to the Association a monopoly of the gas supply until 1950, was concluded with the commune of Velber, a district situated in the neighbourhood of Hanover.

At Flushing, it was found necessary to enlarge the show-room premises; and progress was made with this extension.

In the course of the half year under review, the Compagnie Continentale du Gaz secured a prolongation of its gas contract with the commune of Romilly, together with preferential rights in regard to the supply of electricity, from the year 1923 to the year 1950.

The Directors recommend a dividend for the half year ended June 30 of 4½ per cent., less income-tax.

EUROPEAN GAS COMPANY, LIMITED.

Attaching Employees to the Company—Pension Scheme and Percentage Payment on Salaries or Wages through the Caisse Nationale.

An Extraordinary General Meeting of the European Gas Company was held last Tuesday, at the London offices, Finsbury House, Blomfield Street, E.C.—Mr. R. Hesketh Jones in the chair—for the purpose of considering and, if thought fit, passing a scheme of pensions for the employees and workers of the Company in France.

The Secretary (Mr. W. B. Brady) having read the notice calling the meeting,

The Chairman said he hardly thought an apology was needed for calling the shareholders together for the fourth time in this year of grace 1911; but circumstances arose from time to time with companies, as well as with individuals, necessitating prompt action. The Board hoped that on this occasion the shareholders would, as they always had done, confirm what the Directors had done, and, by a unanimous vote, authorize them to carry out what was now proposed, as set out in the schemes which had been open to the inspection of the shareholders, and which he would endeavour to more fully explain. No one in the room could be indifferent to the strained relationships between employed and employers in France as well as in this country; and it was with the view of recognizing the legitimate aspirations of those in their employ in France, that the schemes they asked the shareholders to authorize and carry into effect had (after much study and consideration on the part of the Board and the chief officers) been framed, and which, it was hoped, would prove acceptable to all parties. For some time past the Company had, from year to year, granted pensions and gratuities to their workmen and officers in France. These grants during the financial year ending March 31, 1901, amounted to £2238, while at the present time they were £5000, and were increasing. Every year the list of the recipients of the grants awarded was carefully revised, and practically renewed, and thus the pensions had assumed a permanent character. The Company had not had any printed scheme; but it had always been understood that, after a man had been in the service of the European Gas Company for 25 years, and had attained the age of 55, he was entitled to a pension if then unable to continue his duties. It had been represented to the Board that these annual grants at the pleasure of the Company were not *bonâ-fide* pensions, and should be of a more permanent character. In view of this by no means unreasonable objection, the Directors had now framed their own—that was, the Company's—pension scheme, which he would call No. 1 scheme, and would endeavour to explain, and ask for it the shareholders' approval. It was proposed that the grants or pensions to existing recipients should be continued under No. 1 scheme; but that no one on entering the Company's service in France after to-day, nor any of the present staff, unless he gave before Jan. 1 next written notice of his desire to do so, should come under this scheme. Thus the Company's own pension scheme would automatically, in the course of a few years, extinguish itself. The qualification for this pension was uninterrupted service for 25 years (military service and illness excepted), age 55, and inability to continue his duties. The pension granted would be one-half the average salary or wages for the past six years' service, increasing by a one-fiftieth of such half for each year of effective service over 25 years, but not to exceed the two-thirds salary or wages. On the death of a pensioner, the Company (without binding themselves to do so) might grant an allowance to the widow if living with her husband at the time of his death, and was at least fifty years of age, and had been married five years. The amount of such allowance would be fixed by the Board in each particular case, and come up for revision every year. Many of the shareholders might not know that the French Government's Law on Compulsory Insurance was fixed to come into operation last July, under which every man receiving less than £120 a year was compelled to pay 9 frs. a year and every employer 9 frs. for each man in his employ—the employer being responsible for the 9 frs. payable by each man. Some men having refused to agree to the deduction by their employers of their 9 frs., the matter had been before the French Law Courts; and it now seemed doubtful whether an employer had the power to enforce the deduction of the 9 frs. from the wages of those in his employ. There was, however, in France an Institution called "La Caisse Nationale des Retraites pour la Vieillesse," which was under the administration of the "Caisse des Dépôts et Consignations," the transactions of which were submitted to a Commission composed of Senators and Deputies, who rendered a report each year of their verification of accounts and securities to the President of the Republic. The "Caisse Nationale" was therefore, in reality, a State Bank; and the deposits were supervised with the greatest care—thus offering complete security. This stability was most important; and it would be difficult to obtain the same stability in an ordinary fund having little capital at its disposal. This institution presented advantages to both parties—employed and employers alike. The objects and rules of the institution had been carefully considered by the Directors (and here he might say, mainly by their Managing-Director, who had had voluminous correspondence and consultations thereon). Many large employers in France—such as Railway Companies and even Corporations—had taken advantage of this institution in providing pensions for those in their employ; and the Board recommended the European Gas Company to follow their example. It was proposed that every one at the present time in the Company's employ, who did not in writing on or before Jan. 1, 1912, notify to the Board his desire to be under the Company's pension scheme (No. 1), and every one who, after to-day entered the Company's service in France, should be a depositor in the "Caisse Nationale" under the following conditions: For every one who had been in the Company's service for five years uninterruptedly (military service and illness excepted), the Company would every year pay on his special pass-book in the "Caisse Nationale" a sum equal to 8 per cent. on his salary or wages during the sixth to the tenth year of service, and 10 per cent. from the eleventh year. These payments would be made partly to funded capital and partly to reserved capital. Although the pension would be due at 55 years of age, the person concerned could defer taking it, and could voluntarily add to the Company's contributions with proportionate advantages to himself. When the pension in the pass-book reached the maximum annuity of £48, the individual might elect that all future payments made by the Company should go to funded capital so as to form a pension for his widow. The Company reserved to themselves the right to modify the pension schemes if, as the result of future legislation, the employers' contribution now fixed by the law of April 5, 1910, was increased, and also in the event of a change in the rules and regulations of the "Caisse Nationale." As all deposits would be inscribed in a special pass-book—the exclusive property of the holder—if he should leave the Company's service, his right to a proportionate pension was not alienated. The "Caisse Nationale" offered two distinct methods for the provision of pensions. Payments could be made to funded capital account (securing an annuity terminating with life), or to reserved capital account, in which case the capital was refunded on the death of the insured. The pension acquired by this means was naturally less than in the case of funded capital. The individual could also at his pleasure provide a pension for his wife by means of personal contributions; but a man need not, however, make any personal contribution, though at the same time he would be encouraged to do so, in order to provide for the widow. The Company considered it desirable to reserve their benefits to men who had not been less than five years in their service. In order to ensure in the fullest possible manner the respective advantages of funded and reserved capital, the Company's contributions to the "Caisse Nationale" would be 2 per cent. to reserved capital, and the rest to funded capital. If the wife was alive at the

death of her husband, she could receive the sum which had been thus reserved, or purchase therewith an annuity. and if she came within the scope of the Compulsory Pension Act, she would also receive, at 65 years of age, a State annuity. If, however, the man died before taking his pension, his widow, or his children, would still receive the whole of the sums paid by the Company to reserve capital. He thought the story he had had to tell was rather a long one, and that it would be somewhat difficult for the shareholders to properly appreciate it without a great deal of study. It had caused the Directors a good deal of thought and study. The "Caisse Nationale" was practically a savings bank, into which a man could pay his savings, and take them out at some future time, or he could purchase a Government annuity. The Chairman concluded by moving "That the scheme submitted to the meeting, for providing pensions for the Company's employees and workmen in France, be, and is hereby, approved."

Mr. H. E. JONES, in seconding, reminded the shareholders that they had heard the Chairman on former occasions say that it had been found impossible to apply to their own case the system that was now so popular, and was doing so much good, in English gas-works. He referred to profit-sharing, or co-partnership, which they all knew had been so influential and powerful for good. In the case of their own Company, they had no sliding-scale of price and dividend by which they could regulate such a system. Their accounts, too, were not the same as those of an English company; and the accounts were not in the same way at the service of everybody. Therefore the British system of co-partnership was found to be impossible. He was sure no one among the shareholders could contemplate the idea of a good and faithful servant being turned away at the end of 25 or 30 years' work—years composed of his best days—without some provision being made for his old age. It was this necessity that caused him personally to become an ardent follower of Sir George Livesey in his co-partnership scheme, which had been a conspicuous success everywhere it had been adopted, especially in respect of the cordiality, loyalty, spirited tone, and animation it had given to the whole of the service. It was hoped by the Board that the proposed method of providing for the men's old days and feebleness would commend itself to the shareholders. There was nothing more in it than that they added to the men's remuneration every year another 8 or 10 per cent. By this means the men were able to accumulate a nest-egg—a provision that was most valuable to them, and which was most valuable in keeping them up to the mark and obtaining good service all round. When in future the shareholders passed the accounts, they would be able to say they had made this healthy and prudent provision. If they did not give the men this kind of encouragement, they would not obtain the best men. Those who had worked in gas-works knew how frequently formerly they had a low class of men; but now they had a higher class of men. But they could not secure the latter without giving them something more than was their mere due in the way of salaries and wages.

Mr. HENRY AUSTIN (formerly a Workman Director of the South Metropolitan Gas Company) said he should go away from the meeting much grieved if he did not bear testimony to the efficacy of superannuation. He had himself been a worker from childhood to manhood; and during the past twelve months he had had perfect rest, owing to the superannuation scheme of the South Metropolitan Gas Company. He supported the present scheme most heartily. He was sure that, when workmen were considered in the light and spirit in which Mr. Jones had spoken, better service was obtained from them, and better and more intelligent men were secured. If they could bring every workman into the scope of monetary responsibility, it was better than no responsibility at all. Under the ordinary conditions of labour, a man said "If a strike comes to-day, I have not much to lose;" and therefore a man, like a master, must have something at stake—something to lose. In consequence, co-partnership and superannuation were things he heartily supported.

Mr. E. WOOLLEY was certain the Board would find themselves cordially supported in this wise move that they had taken. He should like, however, to know approximately what the scheme would cost; but if there was any reason for not making a statement, he would not desire an answer.

The CHAIRMAN replied that it would be difficult to say even approximately what the cost would be. But as the shareholders had heard, the Company were now expending about £6000 a year under the present scheme, and that was likely to be, and would be, increased to some extent. But he was certain of this, that the burden would not be too great for the Company to bear.

Mr. H. D. ELLIS heartily sympathized with the scheme. He understood their pension fund was formed only by the contributions of the Company. There was no compulsory contribution on the part of the employees and the State—nothing analogous to the English insurance scheme?

The CHAIRMAN said that was so.

Mr. ELLIS and Mr. W. B. PRATT raised other points which brought elucidating answers from the Managing-Director (Mr. W. Williams) and the Chairman; and they merely went to prove that the scheme incorporated every possible safeguard.

The adoption of the scheme was then carried unanimously.

A vote of thanks was passed to the Chairman and his colleagues on the motion of Mr. WOOLLEY, seconded by Mr. AUSTIN.

DANISH GAS COMPANY.

Annual Report.

At the annual meeting of the Danish Gas Company on Thursday, the Directors will report that the net revenue for the year ended the 30th of June was £70,873, being an increase of £646. Adding the amount brought forward, the total credit to the profit and loss account is £110,058. In view of the fact that the accounts include the profit earned at Aalborg for six months only, the Directors think this may be regarded as satisfactory. Deducting from the amount the interest on debenture capital, loss on exchange, and setting aside £13,000 to the reserve and redemption account, there remains £86,317 available for distribution. An interim dividend of 2½ per cent. on the preference shares and 4 per cent. on the ordinary shares has already been paid; and the Directors recommend the declaration of a dividend of 2½ per cent. on the preference shares and 5 per cent. on the ordinary shares, together with a bonus of 1 per cent. upon the latter shares. These dividends and the bonus, if approved, will amount together to £43,500, and leave a balance of £42,817 to be carried forward. The amount charged to capital account during the year for additional land, mains, meters, &c., including the acquisition of gas and water works at Hörsholm, near Copenhagen, and gas-works and a roofing-felt factory at Ribnitz, in Mecklenburg, is £51,758. The concessions for the supply of these new districts are favourable; and a fair return on the capital invested is expected in the near future. A sum of £84,872 is written out of the capital account for the Aalborg works; these having been taken over by the town on Jan. 1, as intimated in the last report.

Accompanying the Directors' report is that of the Engineer (Mr. A. W. Edwards), who states as follows: The total consumption of gas in the twelve months was 1,095,208,000 cubic feet, against 1,102,063,000 cubic feet in the previous year; showing a decrease of 6,855,000 cubic feet, or 0·62 per cent. This is accounted for by the loss of the Aalborg station, which was taken over by the town on the 1st of January last. The remaining stations all show increases in consumption, amounting together to 40,470,000 cubic feet, or upwards of 4 per cent. The new works at Flensburg have been brought into use; and the result of the working generally is satisfactory. It will be necessary in the coming year to commence the erection of a new gasholder. The old works have been pulled down, and some part of the plant removed to the new works and some sent to other stations of the Company. Large new districts have recently been incorporated in the town; and one of them (Klues) will shortly be supplied with gas from the Company's works. The Odense works are still in a good condition as regards productive capacity, and will not need extension for a few years to come. The new gasholder at Elsinore has been taken into use; and plans are being prepared for the extension of the retort-house. Electricity works have been built by the commune. New land has been purchased at Viborg, close to the Company's works, with a view to future extension. The great increase at the Assens station is very satisfactory, taking into consideration that electricity works have been built. The increase is largely due to the introduction of prepayment meters and free services. The extension of the offices and accommodation for the workmen at Strandvei has been completed and brought into use. The new trunk main from the Frederiksberg works to the centre of the town has been completed, and the result is satisfactory. Plans are being prepared for a new gasholder and new washer plant for these works. The new district of Hörsholm is large and promising, and the erection of a new gasholder will shortly be commenced. Good business is to be expected at Ribnitz. Lectures have been given with a view to instructing the public in the use of gas for cooking and other purposes; and a show-room has been opened. In conclusion, Mr. Edwards says the prices for coke, tar, and ammonia are satisfactory; and it is expected that there will soon be an increased demand for tar and a considerable rise in the price. All necessary alterations and repairs have been carried out or are in progress; and the stations will be in good working order for the winter.

PROFITS IN AID OF RATES AT MANCHESTER.

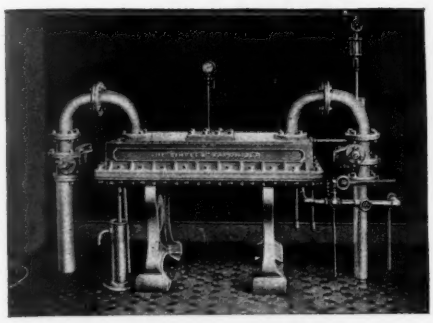
The Special Committee appointed some time ago by the Manchester City Council to go fully into the question of the contributions made by the trading departments in relief of rates, and report upon a scheme that will determine automatically the amount to be paid each year by such Committees, met last Tuesday. At the conclusion of the sitting, it was stated that the Committee had done no more than discuss preliminaries, but before adjourning had decided to obtain further information on certain points from the trading committees.

Opinion in the Council, says a Manchester correspondent, is very much divided on the question of the amount which the profit-earning departments should contribute in relief of rates; and the appointment of the Special Committee to fix upon a basis on which the contributions should be made was the direct outcome of the friction which manifested itself between the Gas Committee and Electricity Committee when the estimates were before the Council in May last. Some members of the Council consider that the trading committees hand over as much as can reasonably be expected; while others think that the Electricity Committee do not contribute their fair share in relief of rates. There are a good many, also, who hold the view that the Gas Committee, as well as the Tramways Committee, should not be forced to give so much each year. They argue that the consumers should have consideration in reduced charges for gas, and the public cheaper fares on the tramways. This year the total amount extracted from the trading departments in aid of rates was £169,500, made up as follows: Tramways, £85,000; gas, £50,000; electricity, £24,500; markets, £10,000.

At the May meeting of the Council, the minutes of the Electricity Committee contained a resolution that for the present year and onward the department's contribution in relief of rates should be 1 per cent. on the mortgage debt outstanding at the close of the preceding year. This resolution, however, was referred back, and will now be considered by the Special Committee, which is composed of the Chairmen and Deputy Chairmen of the Gas, Electricity, Tramways, Markets, Water, and Finance Committees, together with the Lord Mayor and Aldermen Carter and Smethurst and Councillor T. Fox.

In connection with this matter, it is recalled that, in dealing with certain Gas Bills, Parliamentary Committees have suggested that a maximum of only 1 per cent. on the outstanding debt should be paid over in aid of rates. Applying this principle to the Manchester gas and electricity undertakings, the position as to rate aid would mean, roughly, £20,000 from electricity and £12,000 from gas. At present, the contributions from the various trading departments in aid of rates are not at all regulated with regard to the capital of the citizens involved. In one case, it is 4 per cent., in another 1 per cent., in a third less than 1¾ per cent., and in a fourth it is less than ½ per cent. There is a growing feeling in the Council that the time has come when the matter should be put on a fixed basis, and not left to caprice.

NAPHTHALINE AND ITS CURE.



THE "SIMPLEX" VAPORIZER.

THE "SIMPLEX" VAPORIZER.

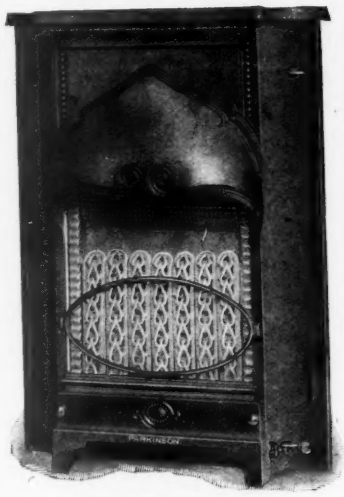
This Apparatus is specially suitable for the prevention of Naphthaline deposits in the districts.

Fixed near the inlet or outlet of Gasholder, it can be used to vaporize a suitable Hydrocarbon into the Gas in such quantities as to entirely prevent the deposition of Naphthaline in the mains or consumers' services.

Orders received from Hampton Court, Great Harwood, Clitheroe, Jersey, Kilmarnock, Hornsey, Gt. Yarmouth, Walton-on-Thames, Banbury, Warwick, Cleckheaton, Mitcham, Liverpool, Brisbane, Merthyr Tydfil, and St. Albans.

PRICES AND FURTHER PARTICULARS CAN BE OBTAINED FROM

ROBERT DEMPSTER & SONS, LTD.,
ELLAND, YORKS.



THE "CRETAN."

HEATING EFFICIENCY.

We have introduced this season an entirely new fuel whereby

INSTANTANEOUS INCANDESCENCE

is effectually secured. Also a new Gas-Air Adjuster of exceedingly simple design and operated without removing the fender.

The above used in conjunction with our New Pattern Fires,

The PATHAN SPARTAN CRETAN Series

ensures **The Highest Heating Efficiency** with the **Lowest Possible Gas Consumption.**

See our New Season's Booklet for other features of this Series.

THE PARKINSON STOVE CO., LTD., BIRMINGHAM & LONDON.

JUST PUBLISHED. BOUND IN CLOTH. 150 PAGES. 40 ILLUSTRATIONS.

Price 2s. 6d., Post Free.

PRACTICAL ADVICE ON GAS-FITTING,

By R. HALKETT,

Assistant Superintendent, City of Leeds Gas Mains and Distribution Department.

The work is the outcome of a number of years' practical training and experience on part of the author, and is an invaluable book for all engaged in the Fitting branch of the Gas Industry.

WALTER KING, "JOURNAL" OFFICES, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

Carbonizing Made Easy.

GLOVER-WEST SYSTEM

OF

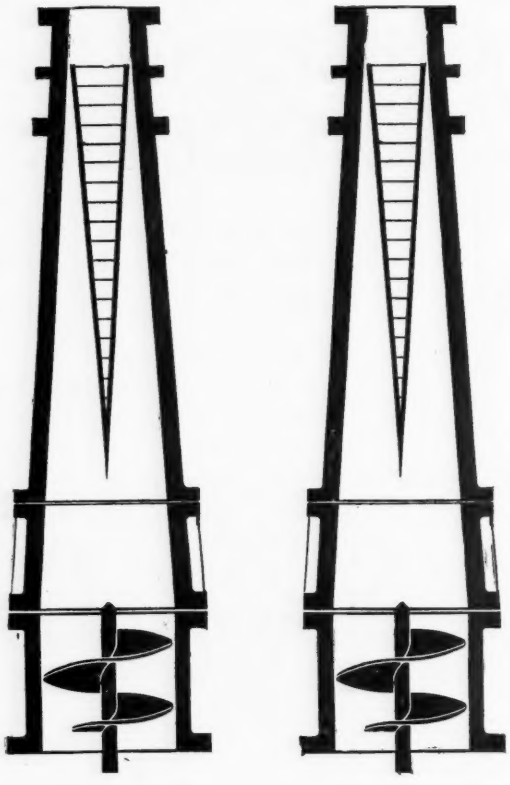
VERTICAL RETORTS.

CONTINUOUS CARBONIZATION.

HIGH GAS MAKES.

SUPERIOR COKE AND OTHER RESIDUALS.

NO SMOKE, DUST, OR STEAM NUISANCE.



LOWEST FUEL CONSUMPTION.

SIMPLE MECHANISM.

HEAT RECOVERED FROM COKE AND UTILIZED.

EASY CONTROL.

REQUIRES

MINIMUM ATTENTION

GIVES

MAXIMUM RESULTS

WEST'S GAS IMPROVEMENT COMPANY, LTD.

MILES PLATTING, MANCHESTER.

GAS EXHIBITION AT HULL.

There was opened on Monday of last week in the Hull City Hall an excellent exhibition of gas appliances for lighting, cooking, and heating purposes organized by the British Gaslight Company, who secured the assistance of a number of the leading manufacturers. Referring to the matter, a local paper said "the exhibition is arousing the keenest interest throughout the city, especially in the minds of those who are advocates of electricity." Much attention is naturally bestowed upon a suite of tastefully appointed rooms, in which some of the many uses of gas are attractively demonstrated. The services of Mrs. M. Dunn were retained for a series of lectures dealing with every class of cooking—special attention being devoted to paper-bag cookery. Among the number of firms exhibiting are Messrs. Wilsons and Mathiesons, Messrs. Fletcher, Russell, and Co., the Davis Gas-Stove Company, Messrs. John Wright and Co., the New Inverted Incandescent Gas-Lamp Company, and the Veritas Light Company.

At the opening ceremony, there was a large attendance; many members of the Corporation and officials being present. Mr. John Young, the Engineer and Manager of the Hull station of the British Gaslight Company, presided; and before declaring the exhibition open he drew attention to the advantages of gas—particularly from a hygienic standpoint. In the course of his remarks, he said that the value of gas as a lighting and heating agent had been increasingly appreciated in Hull during the past few years could be shown by stating the amount of progress made in the last decade. The annual output of gas had increased from 1055 million to 1435 million cubic feet—an increase of 36 per cent. The number of consumers had gone up from 24,247 to 44,917—an increase of 85 per cent.; the number of cookers on hire, from 4670 to 12,606—an increase of 170 per cent.; and in humbler homes there were 20,000 gas-grillers and gas boiling-rings in daily use. Since the introduction of incandescent lighting, the necessity for a high illuminating power gas had gradually decreased; and the endeavour of the modern gas engineer was to produce a gas of calorific value without much regard to illuminating power. This trend of modern practice was all in favour of producing a cheaper gas; and he trusted the day was not far distant when gaseous fuel would be the rule and not the exception, and when, through its use, the atmosphere of the great cities would have been cleansed, and the hygienic value of gas for all purposes would have been recognized, and have tended to improve the public health. He need scarcely remind them that in Hull they had cheap gas—very few places in the kingdom being supplied at so cheap a rate; and the greater the use of gas by the public, the greater became the possibility of reducing the price. It was a pleasure to him to acknowledge the kindness of the Corporation and all the corporate officials in connection with his work in the city.

THE GAS EXHIBITION AT CARDIFF.

Opening by the Lord Mayor.

In the "JOURNAL" last Tuesday, reference was made to the exhibition of gas appliances which was opened on the previous day, in the Park Hall, Cardiff, under the auspices of the Cardiff Gas Company, and with the co-operation of all the leading gas stove and fittings manufacturers. The opening ceremony was performed by the Lord Mayor (Alderman C. H. Bird), in the presence of a large assembly. In the unavoidable absence of the Chairman of the Company (Dr. Taylor) through illness, Colonel H. OAKDEN FISHER presided.

Colonel FISHER, in opening the proceedings, said it was his pleasure to ask the Lord Mayor to be good enough to open the exhibition. He knew how very busy the Chief Magistrate of the city must be; and his presence was a guarantee that, though he might be interested in a lighting concern somewhat similar to their own, he was at the same time imbued with a spirit of fairness which brought him to the exhibition to see that Cardiff might possibly benefit by it. The Company welcomed him and the public to the exhibition because they thought they could show as good an illuminant as other people, and one which was as economical in its use and harmless to health. The trouble of dirt and dust from coal-fires was done away with in their improved and more hygienic methods of cooking; and they were of the opinion that they could give as good a light as any other on the market and at the same time a more economical one. He concluded by asking the Lord Mayor to declare the exhibition open.

The LORD MAYOR said it afforded him very great pleasure to be present to associate himself with the exhibition; and he very cordially congratulated the Gas Company on the successful efforts they had put forth to place a healthy, economical, and highly useful illuminant within the reach of every person in their great city. Whether it came from gas, oil, or electricity, they welcomed every attempt to produce a good light at a cheap rate; and with this they would all agree—that the Gas Company had done in the best way they could all that was possible to serve the city, with a view to encourage the putting forth of the highest efforts to lift it high among those who were leading the world in the achievement of great things commercially, scientifically, and socially. He only hoped they would be able, as he believed they would, to serve the town equally as usefully in the future. Having referred to the superiority of modern illuminants as compared with those of a past time, and laid stress upon the value of gas for culinary and heating purposes, he expressed the hope that the Gas Company would meet with continued success. They had an excellent directorate, with Dr. Taylor at the head; also a good Secretary in Mr. George Clarry, and an able and most courteous staff. While the Company was managed as it had been, their efforts in the future would be attended with the same satisfactory results as they had been in the past. He hoped the gas consumers would take the fullest advantage of the exhibition, and be able to appreciate at first hand what the Gas Company had done for them. It might be thought that he should speak up for electricity; but he felt they wanted all kinds of light. Competition did good, and they would not rest content to-day with what satisfied their fathers. The exhibition was a sign of the times. A few years ago, present-day facilities did not exist; and it could not have been held. It was an exhibition that would do credit to the Gas Company and to the City of Cardiff; and he had great pleasure in declaring it open.

As he spoke, the Lord Mayor switched on two powerful incandescent lights; and the hall, which was previously well illuminated, was now flooded with light.

Mr. H. M. THORNTON, who was present as the Managing-Director of the Richmond Gas Stove and Meter Company, Limited, moved a vote of thanks to the Lord Mayor, and expressed their gratitude for the broad-minded manner in which Cardiff's first citizen had referred to gas lighting in relation to other lights in the city. Large undertakings, if they were to succeed, must, he said, act in friendly, if keen, rivalry with each other. He knew Mr. Clarry, the able and courteous Secretary of the Gas Company, fostered this good feeling. He was glad that the Lord Mayor, representing the city and people of Cardiff, had considered it his duty to come and give them his very powerful support and encouragement.

Mr. CLARRY, in seconding the motion, said the Company had done all they possibly could to bring before the inhabitants of Cardiff the economic and hygienic advantages of gas. Everything in the exhibition was in practical working order; and he trusted the visitors would test anything they saw. The Lord Mayor's presence had added very much to the pleasure of the proceedings.

The motion was carried by acclamation, and briefly acknowledged by the Lord Mayor.

The visitors then inspected the exhibits, which were supplied by the following firms, in addition to the Gas Company and some local firms: Crossley Bros., Limited; Davis Gas-Stove Company, Limited; William Edgar; Ewart and Son, Limited; Falk, Stadelmann, and Co.; G. Hands and Co.; New Inverted Incandescent Gas-Lamp Company, Limited; R. & A. Main, Limited; A. E. Podmore and Co.; Richmond Gas Stove and Meter Company, Limited; W. Sugg and Co., Limited; Voelker Lighting Corporation, Limited; and John Wright and Co. The general arrangements of the exhibition were under the supervision of Mr. Clarry and Mr. H. H. Langford, the Gas Company's Outdoor Superintendent.

In connection with the exhibition (which will remain open till Saturday), cookery demonstrations are given twice daily by Miss Jennie Barker; and they have been closely followed by good audiences. On Tuesday, at the first cookery competition for girls, there was a large attendance of students from the Cardiff centre; and on Saturday a number of schoolboys took notes for the essay competition arranged for them.

GAS-HEATED HOT-WATER APPARATUS.

Proportioning the Parts.

In the course of a series of lectures recently delivered by Mr. Frederick Dye, the chief of the Hot-Water Department of Messrs. John Wright and Co., to large audiences composed of the inspectors and fitting staff of the Birmingham Corporation Gas Department, he pointed out that a hot-water apparatus, to be successful, should have its parts proportionate one to another, while the whole should be proportionate to the demand which has to be met. While a certain size of hot-water storage-tank might be suitable for a £50 house, and meet all the needs usually experienced there, it would probably be a failure in a house of £100 yearly rental, as the tank would be exhausted in satisfying half the daily requirements of such an establishment. It is not so difficult to decide on the size of the heater, as this may form part of the tank, as is always the case with the best types of combined heater and storage tanks; while with a separate boiler, the makers' catalogue probably states what duty the different boilers will be equal to. It is in deciding the size of the storage itself that presents difficulties to the inexperienced, as there are few, if any, data to go upon. This detail formed a valuable part of Mr. Dye's lectures; and the following proportions were given:—

Approximate Rental of House.	Number of Taps.	Size of Hot-Water Storage-Tank or Combined Boiler and Tank.
£50	Bath, sink, and lavatory	20 gallons.
60	Bath, two sinks, and lavatory	30 ,,
80	Bath, three sinks, and two lavatories	40 ,,
100	,, ,, ,, ,, ,, ,,	50 ,,
120	Two baths, three sinks, and two lavatories	60 ,,

Mr. Dye showed that the question of proportions has another bearing in the fact that a large number of hot-water installations, already existing and heated by a boiler behind the kitchen range fire, are more or less failures through being disproportionate in parts. The many applications made by consumers in gas companies' show-rooms are for a gas-heated boiler to assist the kitchen range boiler or work with it, or to overcome some faulty result found with the boiler; and experience shows that dissatisfaction is commonly due to some want of proper proportion in the apparatus. The range boiler may be of insufficient power for the storage-tank, or the tank too large for the boiler (which are not the same thing); and if the inspector has means of knowing what the proportions should be, he is better able to ascertain just what duty the gas-boiler has to perform to put things right, or what alteration (if any) he should make.

New Coal Company.—A Company under the title of Settle, Speakman, and Co., Limited, has been registered with a capital of £200,000, in £1 shares, to take over the business of coal, salt, lime, and general merchants carried on by Messrs. Joel Settle and W. Carroll as Philip Speakman and Sons in London and Liverpool, and at Queenborough, Kent, and as Joel Settle at Alsager, Stoke-on-Trent. The number of Directors is not to be less than two or more than five; and the first are Mr. J. Settle and Mr. W. Carroll, each of whom may retain office while holding 20,000 of the shares to be allotted to them under the purchase agreement. The remuneration of Mr. Carroll is to be £840 a year; of Mr. Settle, as Chairman, £3640.

WATER HEATING BY GAS AND ELECTRICITY.

In the course of a lecture delivered at the London County Council School of Building, at Brixton, Mr. W. FRETWELL made the following remarks upon the use of gas and electricity for water heating.

Gas-heaters consist of two general types. One of these is the instantaneous heater, in which the water is heated as it flows through on its way to the tap; the temperature varying with its rate of flow. The slower it passes through the heater, the more heat it picks up. These instantaneous heaters, commonly termed geysers, pick up a greater ratio of heat than any other apparatus, owing to the water "wiping up" the heat as it flows through, and the small amount of radiating surface and the short period required for heating small quantities of water. They are useful for small and spasmodic needs; but their employment is limited to one or two taps at most in close proximity. A warm bath of 20 gallons may be obtained for 1d. or less in summer. Care must always be taken that the fumes are made to pass into an effective chimney or well clear of the bathroom.

Gas-boilers have recently loomed largely in the public eye, being pushed by the different gas companies; and when conscientiously recommended and installed, they prove convenient and moderate in cost. Gas companies would be well advised to consider the pockets of their clients before recommending the use of gas-boilers in any and every instance, or they may bring discredit upon themselves and their product. Some companies are so alive to this that they recommend gas for cooking, and a coke-fired independent boiler for water when the latter is required in considerable quantities. Gas-boilers are made in copper and cast iron; and so far as actual heat transmission is concerned, there is little to choose. The probability is that the cast iron will outlast the copper. The gas-boiler may be coupled up to an existing apparatus as an auxiliary heater for use when the demand is sudden or beyond the ability of the range-boiler—for morning baths, for example, or to heat the water in summer time when cooking is, perhaps, done by gas. They may, of course, be fixed independently; and for large installations, where gas is preferred, they may be fixed in batteries to supply any volume of water during any period, as and when required. Probably the largest battery of this kind is fixed at the Sandow Institute; some 24 boilers, in two batteries of sixteen and eight respectively, being capable of giving about 700 baths daily. As the demand is more or less spasmodic, their use is manifest.

Gas-boilers may be subdivided into two types; one being a separate boiler which heats the water and delivers it at the top of the storage vessel close to the point where the draw-off service leaves. Or, to use a railway expression, "The hot water goods are dispatched by the direct route to the station nearest the tap, any goods not at once cleared being consigned to the store—the cylinder—till called for; the goods replaced working down the line—the cylinder—back to the boiler to be reheated. The advantage of this type is that hot water is obtained as soon as it flows up from the boiler, and with a proportionate gas consumption. This is a point of considerable importance where a small quantity of water at a high temperature is required, particularly for washing-up purposes, since in the latter instance it will be agreed that temperature is of more consequence than quantity.

For coupling-up to an existing apparatus as an auxiliary heater, and where small quantities of hot water are required at intermittent periods, and gas consumption is a consideration, the separate boiler should be selected. By a simple valve arrangement, the volume of water circulating through the cylinder and boiler, and therefore requiring heat, may be halved—a saving in gas resulting. Thus the whole need only be lighted if, and when, required for baths. A thermostatic valve should be fitted, to reduce or cut-down the gas consumption to a point just sufficient to maintain the water at a predetermined temperature. The amount of gas required for this purpose will depend upon radiation losses; and for this reason the simple cylinder system without any secondary circuits, is best. It is a great advantage to lag the different members of the system.

The other type is really a form of combined boiler and storage vessel. This heats or raises the temperature of the water in the same way as a domestic copper. Thus, to obtain a few gallons for washing-up purposes is neither quick nor economical; being in this case analogous to boiling a pailful of water to make a cup of tea—additional time and fuel being expended. For continuous work, however, and presupposing that the ratio of gas energy transferred is the same as that of the separate boiler, the advantage should, it would seem, be with the latter. This will, though, depend upon the design; and we must remember that the heating surface of a combined heater and storage vessel is restricted to the dimension of the vessel, whereas the separate boiler is not. Respecting cost, a single bath of 20 gallons at 100° Fahr. may be obtained, with gas at 3s. per 1000 cubic feet, for 1d., or continuous baths for rather less, depending upon the temperature of the atmosphere and the cold water. To obtain baths at this cost means that the gas must be shut down immediately after. The importance of shutting off the gas at the earliest moment cannot be too strongly emphasized, as it will obviously affect the bill at the end of the quarter.

Two types of burners are used for this apparatus; one being known as the "luminous" and the other as the "bunsen" or "atmospheric." The total calorific effect is the same, however the gas is burnt, provided its combustion is complete. The luminous flame is frequently employed where a suitable flue is not provided; but the bunsen or atmospheric should always be used where a proper flue is possible. The advantage of the bunsen burner is that air which is admitted to the burner at a point anterior to the burner gives a blue semi-invisible flame, which may have actual contact with the boiler; no sooting and consequent lowering of transmission and smells resulting. With the luminous flame, the boiler is heated by radiation and convection only; and the flame must not, as already mentioned, have contact with the boiler, or sooting will result, accompanied by a falling off in duty. For these reasons, the atmospheric burner will, in practically all cases, give the better results, and, moreover, require least attention. A further point to remember is that the public look upon the atmospheric burner as the more economical, and often hesitate to accept a powerful luminous-flame apparatus. Except in cases where a suitable flue is too difficult to obtain, the only point in favour of a luminous flame is that the bye-pass may be cut-down to consume the minimum quantity of gas, though in practice the atmospheric burner may be cut-down to a point below which it is impossible to maintain an average installation at the required temperature.

The lecturer showed a Potterton standard bunsen boiler-burner which had been tested by the Gaslight and Coke Company. Though capable of consuming 59 cubic feet of gas per hour at 45-10ths pressure (nominally 60 cubic feet), it was proved that the consumption could be automatically reduced to $5\frac{1}{2}$ cubic feet without the burner lighting-back, even when using 25 per cent. of carburetted water gas.

So far, electricity is not a serious factor in the heating of water, though electric kettles and urns are now placed on the market. The obstacle to the use of electricity is cost, since in this country the electricity industrially employed is obtained by the combustion of fuel; the reconversion of electrical energy into heat giving a result which is wasteful and relatively costly. Being independent of any particular appliance or fuel, we may without prejudice consider the relative cost of heating water by electricity, gas, and solid fuel (say, coke). The heat equivalent of an electrical unit is 3410 heat units; and the lowest cost is 1d. per unit. We may, therefore, take 3410 units, and 1d. as a basis. The approximate value of gas per cubic foot (Gaslight and Coke Company) is 540 heat units. Allowing for a flue loss of one-third, we obtain a net transference of 360 units per cubic foot of gas; hence 10 feet = 3600 heat units, which is near enough equal to 1 electrical unit. With gas at 3s. per 1000 cubic feet, the cost would therefore become $\frac{1}{3}$d. as against 1d. for electricity. With coke at the current retail price of 1s. 1d. per cwt. and taking the heat value per pound at 10,000 units, and allowing 50 per cent. of the gross heat to pass up the chimney, we get a net transmission of 5000 heat units per pound; and at 8 lbs. per 1d., the transmission is 40,000 heat units, or practically twelve times that of the electric unit at 1d. per unit. In other words, the heat given out by burning 1s. worth of electricity at 1d. per unit may be obtained for 4d. by using gas, or 1d. with coke.

BIRMINGHAM GAS DEPARTMENT EXTENSIONS.

At last Tuesday's Meeting of the Birmingham City Council, Sir Hallewell Rogers presented the report of the Gas Committee, who recommended that, in any application which may be made to Parliament by the Corporation during the next session, powers be sought to enable the Drainage Board to sell, and the Corporation to purchase, about 37 acres of land adjoining the Saltley works of the Board at Washwood Heath, and to authorize the use of such land for gas-works purposes; and that, subject to such powers being obtained, the Committee be empowered to purchase the land at a price to be agreed. He reminded the Council that in 1901 the Gas Committee proposed to purchase a site called Birches Green; and the Council were satisfied that the department required the land. They then went before Parliament, and the House of Lords passed the Bill; but owing to the opposition of Erdington, the House of Commons rejected the scheme. Since 1901, the output of gas had increased by 50 per cent.; so that the arguments which induced the Council to purchase Birches Green were 50 per cent. more applicable now. It was absolutely necessary that the Committee should have the land; and he hoped the Council would sanction the proposal.

Colonel Martineau inquired whether the price to be agreed upon would be submitted to the Council. Mr. Herrick complained that the atmosphere of Saltley was suffering too much from the gas-works; and he asked for an undertaking that the works now on the west would be scrapped before a beginning was made on the north side. Mr. Arter urged that the Committee ought not to go on with any extensions until the new Council had had an opportunity of expressing their views on the policy of the Committee. He also declared that the gas-fitting department had developed to such an extent that many master gas-fitters had suffered severely.

Sir Hallewell Rogers, in reply, denied that harm had been done to master gas-fitters in the city. As a matter of fact, he said, the Committee had put a great deal of work in their way; and master gas-fitters were doing about two-thirds of the Corporation work in the city. It was the desire of the Committee to work harmoniously with the master fitters. He assured Colonel Martineau that the Committee would be quite willing to tell the Council the amount of the purchase price.

The report was adopted.

PRICE OF GAS AT MARYPORT.

[FROM THE "CARLISLE EXPRESS."]

A discussion took place at the last meeting of the Maryport Urban District Council on the question of reducing the price of gas. The majority of the councillors were evidently in favour of a decrease in the price; but as a Special Committee are considering the whole matter of gas production and supply, it was thought inadvisable to take any step until the Council had been made acquainted with the results of this Committee's inquiries and deliberations. The price of gas in Maryport is 3s. 4d. per 1000 cubic feet. Considering that the town has supplies of coal in its immediate vicinity, the cost is abnormally high. The fact is that Maryport is, and has for years past been, paying for the huge blunders of bye-gone administrators of the town's affairs. At one time Maryport was furnished with gas by a private Gas Company; but as the town grew, it was found necessary for the Trustee Board to have the power of production and supply in their own hands. The Gas Company's shares, which had a face-value of £10, were quoted on the share market at £16. Negotiations were opened up for the purchase of the works; but the Trustees were unwilling to pay the market price, and offered a figure very little more than the par value of the shares. Subsequently, the Gas Company agreed to dispose of the whole concern for £8000. This price was undoubtedly a high figure for the undertaking, as the supply pipes and the manufacturing plant were all considerably the worse for wear. The Trustees

scorned the offer, and determined to call in the services of an arbitrator. The result was that the expenses of the arbitration and the award ultimately given cost the Trustees not £8000 but £16,000. Meanwhile, the town had been applying for parliamentary powers for erecting new gas-works; one clause in the Bill which was promoted binding the Trustees to purchase the existing works. The £16,000 had to be paid; the concern was consequently enormously over-capitalized; and the inhabitants of Maryport to-day have to pay an exorbitant price for gas as the result of the blunder of a past generation. The late Mr. Robert Adair was so disgusted at the protracted nature of the negotiations and the way in which the affair was mismanaged, that he had his gas cut off, and decided to light his house and shop with candles until the town had acquired possession of the works. The present Urban Council, immediately the gas-works show a profit sufficient to warrant a lowering of the price, should lose no time in effecting such a reduction.

CO-PARTNERSHIP AND LABOUR UNREST.

In the notice of the life-work of the late Mr. J. M. F. Ludlow which appears elsewhere, reference is made to a memorial which was in preparation by a number of influential gentlemen advocating the extension of co-partnership as a remedy for unrest in the ranks of labour. The document has now been issued. It bears the signatures of Lord Courtney of Penwith, the Right Hon. T. Burt, M.P., the Right Hon. Charles Fenwick, M.P., Professor Alfred Marshall, Sir W. H. Lever, Bart., Mr. Corbet Woodall, Mr. Charles Carpenter, and a number of heads of important business firms; also of Mr. Amos Mann (President), Mr. Aneurin Williams (Hon. Treasurer), and Mr. Henry Vivian (Hon. Secretary), on behalf of the Executive of the Labour Co-Partnership Association. The memorial is as follows.

The widespread unrest of labour, whether in municipal or private employment, culminating in a near approach to a general strike, paralyzing the public services and the industries of the country, injuring us all, and reducing scores of thousands to the verge of starvation, has once more called every thinking man's attention to the serious defects in our present industrial organization. We do not mean merely the inadequate wages of unskilled labourers, but something more fundamental than even that. Can we be satisfied, men are asking, with a system which divides those engaged in the necessary work of producing wealth into two armies, usually in a state of armed neutrality towards one another, but ever and anon breaking out into violent hostilities? Is there no better way which, without robbing any man or enslaving any man, will unite their interests and their efforts? We think there is. We who sign this memorial have advocated a principle which gives us the hope, we believe the assurance, of such a better way.

The co-partnership of labour with capital is capable of many modifications according to the needs of varying industries, and in some one of them it is applicable to almost every industry where labour is employed. In its simplest form, taking the case of a man employed by a great limited liability company, it involves: (1) That the worker should receive, in addition to the standard wages of the trade, some share in the final profit of the business, or the economy of production. (2) That the worker should accumulate his share of profit, or part thereof, in the capital of the business employing him; thus gaining the ordinary rights and responsibilities of a shareholder. Where men are so employed, they cease to be mere wage servants and become partners in industry. "From slave to serf, from serf to wage servant, from wage servant to partner," said Mazzini. They do not cease to be interested in maintaining and improving the standard rates of wages and the standard conditions of labour; but they do gain also another interest and a wider outlook. They have to look at industry also from the point of view of men who share the ownership and control. Their interest is no longer wholly apart. They meet the other parties to industry on a common footing; they learn to realize a common interest, and all the moral force that arises from common interest and from working together. We believe that in the general application of this principle is the best hope of building up a better industrial system.

Co-partnership assumes a standard wage before there can be any talk of profit to divide. A standard wage assumes organization to maintain it and to raise it. It assumes reasonable forms of trades unionism, collective bargaining, the meeting of capital and labour upon equal terms. Organization of both employers and employed, with conciliation machinery to fall back upon when outstanding differences remain, we regard as necessary in the interests alike of labour, capital, and the community as a whole.

But we say that such organization is not enough. The conflict of interest still remains too acute. It is still too easy for the narrower-minded employer to believe that every gain to labour is filched from his profits, and for the narrower-minded workman that every improvement in profit is filched from his wages. The situation requires to be humanized and softened by some measure of an unmistakable common interest, and by the habit of working together. These co-partnership gives; as it gives the workman also a provision for his old age, amounting gradually to some hundreds of pounds per man in actual instances which we could quote.

A great economist has said that "what labour loses," under a degrading industrial system, "no man gains." So we say that "what labour gains under an elevating system, no man loses." There is better work, not necessarily harder, but more intelligent and more conscientious; there is less interruption and waste, more sympathetic management, and therefore there is more produce to share.

Co-partnership is no mere theory. Worked out originally over long years of struggle, and in great variety of details, by working men in their own co-partnership workshops, adopted from time to time by a few large-minded employers in various trades, twenty-one years ago it was extended in the midst of industrial conflict to one of our greatest gas-works, and only three years ago further extended, and happily in perfect peace, to several more, including the largest; so that now these co-partnership companies control more than half the capital which is invested in gas companies in England.

We say it is time to extend its application still further. The bulk of the great industries of the country might come under its equitable operations. It can already show excellent results in peace, in better conditions, and in prosperity; and as time goes on, these results are accumulative. To-day it is a marvel that, through co-partnership, the workers in the three London Gas Companies have nearly £600,000 accumulated in the capital of the works in which they work. But the yearly growth of this sum shows that it is but a beginning. By co-partnership, said a celebrated employer, who gave his heart to it, the working classes in the next generation will make as big a step forward in material prosperity as the middle classes did in the last.

It has been well said that nothing is settled which is not settled right; and we are convinced that the wage system alone is not capable of removing the deeper causes of the labour unrest which prevails. We know that no mere change of machinery can be a substitute for a right spirit, though right machinery and a right spirit act and react to perfect one another. But our practical experience of co-partnership emboldens us to call upon the great employers and the trusted leaders of labour, and the general body of men and women of good intent, to consider whether co-partnership be not at least a great part of the solution of the industrial problems which have of late so forced themselves upon our attention.

THE JOHANNESBURG GAS-POWER PLANT.

In view of the recent decision in the action brought by the Johannesburg Municpality against Messrs. D. Stewart and Co. (1902), Limited, and Mr. William Beardmore, for damages for the abandonment of the contract in connection with the power plant, to which reference was made in the "JOURNAL" last week (p. 192), it may be of interest to reproduce from the Engineering Supplement to "The Times" for the 18th inst. the following details of the scheme and some remarks upon it.

It was in 1902 that the Corporation of Johannesburg, having decided to instal a lighting and power system in conjunction with electric tramways and electric supply for lighting and power throughout the town, called in a London firm of consulting engineers to advise them. The firm investigated the problem on the spot, with a view to elaborating a complete system which should include many miles of tramway, a distribution system to serve the central and busy parts of the town by direct current, and the very large suburban districts—the total area of the supply exceeding 100 square miles—by alternating current. They proposed a generating station at a central site already partly occupied by a small existing gas-works and by a small electric generating station, both of which were owned and worked by the Municipality. After full consideration of the circumstances, it was suggested that tenders should be invited for both steam and gas engines for driving the generators. The engineers prepared the specifications in great detail, and tenders were advertised for in the usual way, not only for the generating plant, but also for the whole of the work and material involved in carrying out the tramway and electric supply system. Every part of the scheme proved eminently successful with the exception of the generating station, over which the action just terminated was fought. The scheme was criticized locally on the ground that the requirements of the town had been greatly over-estimated. Subsequent experience, however, showed that this criticism was groundless, and the estimates of the amount of traffic and consumption, of revenue and working costs, have, it is claimed, been justified by events. The proposal to instal gas-engines was objected to by local engineers, largely on the ground that the Transvaal coal was said to be unsuitable for making gas.

When the alternative tenders for the steam and gas plant were received and examined, it was found that while the gas-engine plant would in first cost exceed that of the steam plant for the same output, the estimated economies resulting from the working of such a plant would more than compensate for the additional capital outlay. The engineers therefore recommended that, subject to guarantees of unusually stringent and substantial character being given by the tenderers, the electric generators should be driven by gas-engines supplied with producer gas made from local bituminous coal. There was furnished to the Corporation a long list of electric installations then being successfully driven by large gas-engines, the list containing many examples of engines as large as the 1000 H.P. and 2000 H.P. engines included in the Johannesburg scheme. The importance of local conditions was recognized. Coal was cheap; the price delivered at the works being about 12s. per ton. Water was very dear—about 3s. 6d. per 1000 gallons. A great deal turned upon the question of the coal. The local opinion was that it could not be used for making producer gas; but against this was to be set the fact that a considerable quantity had been sent home by the Corporation, and, as stated at the trial, had been practically tested with satisfactory results by several well-known makers of producers—indeed, at the moment when the local critics were loud in condemnation of the fuel, a report was, it is stated, received from one of the most experienced producer makers to the effect that it was an ideal producer fuel.

A second opinion was sought by the Corporation—that of Professor Unwin, who supported the recommendation of the consulting engineers that, subject to the necessary guarantees, a tender for gas plant should be accepted. Finally, a contract for gas-producers and cleaning plant and for generating plant comprising Oechelhaeuser gas-engines direct coupled to Siemens electric generators, both alternating and direct current, was placed with Messrs. D. Stewart and Co., with whom Messrs. Beardmore were associated. The latter firm had built and successfully used in their own steel works a number of large gas-engines; they were the licensees for the manufacture of the Oechelhaeuser engines in this country; they had had many years' experience of the working of large gas-producers, consuming bituminous coal not very different in character from the Transvaal coal; and, finally, they were, it is understood, successfully supplying their own gas-engines with gas from this coal—their various works depending wholly or partly on power so obtained.

It may be that, in deciding upon the installation of gas-engines, the engineers, the contractors, and the municipality were going a little in advance of practice at that time; but it was believed that the risk might be safely undertaken, and that the Johannesburg plant would be

the pioneer of many similar installations. Now that the full story of the case has been told for the first time, the advocates of the employment of large gas-engines in electric power stations may gather encouragement from the fact that the failure was due to faults in detail, and not to any radical defect in gas-engine design as applied to such service.

LIVERPOOL WATER SUPPLY.

In reply to a vote of thanks, at the last meeting of the Liverpool Corporation Water Committee for the current financial year, Colonel Porter, the Chairman, said the past twelve months had been so deficient in rainfall that in many parts of the country there had been great inconvenience, and even suffering, from want of sufficient water for domestic and trade purposes. Even in large communities, such as Manchester and Bradford, where works of an extensive and costly character had been carried out in quite recent years, the shortness of water had been so serious that it had been found necessary to cut off the supply for a considerable part of every day. In the Liverpool district, they had fortunately been entirely free from any such disaster. A constant service had been steadily and uniformly maintained throughout; and they were closing the year without having felt any undue or embarrassing strain on their great water resources. Not only so, but they had been able to give temporary supplies to at least two districts where the local sources failed. The total quantity of water supplied from the Liverpool works during the year ended Sept. 30 last was 12,700,335,000 gallons, and for the corresponding period of last year 11,932,082,000 gallons; so that there had been a total increase for this year over 1910 of 768,253,000 gallons. The average quantity supplied per week this year was 244,237,000 gallons, as against an average of 229,463,000 gallons last year, or an increase of 14,774,000 gallons per week. About one-tenth of the above quantities was sold in bulk to places outside the compulsory limits of the Liverpool supply. The number of new water consumers added to the rent-roll during the year, after deducting the losses by demolitions of property and by removals, was 977. This was less by 667 than in 1910. The total quantity of water supplied by meter for trade purposes in the city and suburbs during the year was 2,617,869,000 gallons—being an increase of 106,037,000 gallons. There was also an increase of 14,624,600 gallons in the quantity supplied to shipping during the year. The length of new mains laid in the twelve months was nearly 9½ miles—an increase of 3¼ miles over 1910.

A grant of £150 has been made by the Selby Urban District Council to Mr. Bruce Grey, the Surveyor, for services rendered as Acting Resident Engineer and Clerk of Works in the construction of the new water-works, extending over a period of five years.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

I have received the abstract of the accounts of the Kilmarnock Gas Department for the year to May 15 last. There was a capital expenditure during the twelve months of £3181, raising the total to £116,255. The income amounted to £29,411, of which £21,787 was derived from the sale of gas, £3050 from the sale of coke, and £3989 from the sale of tar and sulphate of ammonia. The manufacture of gas cost £15,866, of which £9269 was expended upon coal, £249 upon benzol, £584 upon lime, £1544 upon maintenance of works, and £3619 upon wages of stokers and yard workmen. Distribution of gas cost £2112. Rents, rates, and insurances came to £1315. The total expenditure was £22,162; and there was thus left a balance of £7249. There was paid interest amounting to £2378, contributions to the sinking fund amounting to £1670, and contributions towards capital expenditure £3636. There is a balance of £3062 carried forward to the current year. The quantity of gas manufactured during the year was 186,194,000 cubic feet—an increase of 10,868,500 cubic feet over the previous year. Coal carbonized amounted to 18,861 tons—an increase of 458 tons. The average price of coal per ton was 10s. 0½d., as compared with 10s. 7d. the previous year. The make of gas per ton of coal was 9872 cubic feet—an increase of 372 cubic feet. Gas unaccounted for amounted to 20,334,393 cubic feet—equal to 10·9 per cent., as compared with 9·9 per cent. the previous year. The revenue from gas (the price of which has for the past three years been 2s. 6d. per 1000 cubic feet) showed an increase of £1218; and the revenue from residual products an increase of £741. The cost of the manufacture of gas is stated, per ton of coal, at 16s. 9·90d.; and the cost per 1000 cubic feet at 1s. 8·45d. The cost of distribution is stated at 2s. 2·87d. per ton of coal, and at 2·72d. per 1000 cubic feet. The total expenditure was equal to £1 3s. 6·03d. per ton of coal carbonized, and to 2s. 4·56d. per 1000 cubic feet of gas. Adding the profit on the year's working, which was equal to 6 per cent., the total expenditure is stated at, per ton of coal carbonized, £1 11s. 2·27d., and per 1000 cubic feet of gas at 3s. 1·90d. The value of the works is stated at £75,261—equal to £404 12s. 6d. per million cubic feet.

The exhibition of gas appliances promoted by the Corporation of Aberdeen, which closes to-night, has been a pronounced success. We shall hear of the results flowing from it by-and-bye. The engagement of Mr. Dunn, of Stockton, as demonstrator, came to a close last Saturday evening. Since then the lectures and demonstrations have been given, in the evenings and on the afternoon of to-day, by Miss Ferguson, of the Aberdeen School of Domestic Science; and on the other afternoons of the week by the students of the School of Domestic Science. On Tuesday evening, an official visit was paid to the exhibition by the Gas and the Lighting and Fires Committees of the Town Council, as well as of the Magistrates and a large contingent of the

Five Years in Daily Use.

9th Octr 1911

Dear Sirs.

You will be interested to hear that the 55 Bland Light fixed in Ross Church some five years ago. Continues to give every satisfaction and have proved very economical.

The whole years gas bill at 3/10 per 1000 has cost us £5 7. 9 only.

Some of the mantles have been in use more than 18 months and this with daily services.

The "Bland" burner should specially appeal to Churchwardens as one of the few opportunities of saving money.

Yours faithfully,
Wm Watson
Churchwarden.

Mess Bland & Co
London.

THE BLAND LIGHT SYNDICATE, LTD., 63, Queen Victoria St., LONDON, E.C., & 20, Fennel St., MANCHESTER.

Council. Mr. S. Milne, the Gas Engineer, received the visitors, and conducted them round, explaining the leading features of the exhibition. In the course of the visit, the great success of the exhibition was referred to; and it was stated that since the Town Council intimated their intention to fix cooking appliances free, the Gas Department have booked about 2000 orders for gas heating and cooking appliances.

I have just learned that Mr. Adam Macpherson—after a residence of forty-two years in Kirkcaldy, during thirty-five of which he was Engineer and Manager of the Kirkcaldy Gaslight Company, Limited, and latterly was Chairman—has taken up his residence in Edinburgh. It has also reached my ears that since the transfer of the gas undertaking has been completed, some of the name plates affixed by contractors to apparatus in the gas-works (bearing Mr. Macpherson's name as the engineer to whose plans the apparatus had been made) have disappeared. If this is so, what is the explanation?

The Chief Constable of Dundee adds his testimony to the value of public lighting in the matter of the prevention of crime. It is an old saying that a gas-lamp is about as good a preventive of crime as a policeman. In Dundee, the Chief Constable made the statement before the Police and Lighting Committee of the Town Council the other day that "when we have more light, we have less crime. An important factor in the fall of the criminal barometer is the improved lighting of the city." This was said in support of a movement, which is fortunately making progress, to have all the common stairs in the city adequately lighted. Mr. Neave, who is Convener of the Committee, stated that there are now between 1500 and 1600 stairs lighted; so that they were making great progress in this matter.

On Thursday, the Directors of the Leven and Methil Gas Company, Limited, formally inaugurated a spiral-guided gasholder which has recently been erected at the gas-works by Messrs. Henry Balfour and Co., Limited, of Leven. Afterwards, at dinner in the Central Café, Provost Balfour (of Messrs. Henry Balfour and Co.) presented Mr. Hogg, the Chairman of the Gas Company, with a rose-bowl as a memento of the occasion. Mr. Hogg, in acknowledging the gift, referred to the steady progress of the business of the Company, and to the great success which had attended the working of the new sulphate of ammonia plant. The Contractors were complimented all round upon the high quality of the work which they had put into the new gasholder.

The Corporation of Glasgow have, on the recommendation of a Special Committee who were appointed to consider the matter, resolved that the proposal to hold a smoke abatement exhibition this winter be abandoned. It has been left in the hands of the Committee to make the necessary arrangements for holding such an exhibition in the autumn of 1912—in the event of it being found that it would receive the cordial support of a sufficient number of exhibitors.

An action for interdict has been brought in the Court of Session, at the instance of several manufacturers in Aberdeen, against the Corporation of the city. The Corporation promoted a Bill in Parliament in 1910, in which they sought authority to take a supply of water for the city from the River Avon. The measure was very keenly opposed, and it was not passed by a Select Committee of the House of Lords. The cost of promoting this abortive measure amounted to £15,521. The Corporation, in making up their estimates in the Water Department for the year now running, included half of this amount (£7760) in the year's expenditure. The complainers seek to interdict the Corporation from laying any assessments upon the ratepayers in respect of the parliamentary expenses. They maintain that the promotion of the Bill was inexpedient and ill-advised, and was not in the interests of the community, and that therefore it is illegal and *ultra vires* of the Corporation to impose any assessment for the purpose of defraying any part of the expenses. The Corporation have lodged answers, in which they state that they were advised by competent persons that it was necessary to obtain an additional source of water supply. The present supply, taken from the River Dee, they were advised, and they believed, ran serious risk of contamination by sewage. They were advised that the best course for them was to take a new supply from the River Avon. It is maintained that the respondents have acted in accordance with what has always been the invariable practice of municipal bodies in Scotland; the promotion of such Bills being regarded as incidental to, and necessary for, the proper discharge of the duties of such bodies. The promotion of this Bill was, in fact, incidental to, and necessary for, the proper discharge of the respondents' duties. Counsel will be heard in the case in the course of next week.

CURRENT SALES OF GAS PRODUCTS.

[For Table of "Tar Products Prices," see p. 267.]

LIVERPOOL, *Oct.* 21.

Sulphate of Ammonia.

There has again been an active market during the past week, and a fair volume of business has been transacted in the near positions at prices tending in favour of the sellers. A considerable amount of fresh inquiry has come forward from various sources, which has only been filled at hardening values, and the closing quotations are: £14 3s. 9d. to £14 5s. per ton f.o.b. Hull, £14 5s. to £14 6s. 3d. per ton f.o.b. Liverpool, and £14 6s. 3d. to £14s. 7s. 6d. per ton f.o.b. Leith. For distant delivery, there has not been so much interest shown. Producers continue to ask £14 7s. 6d. to £14 10s. per ton f.o.b. at the principal ports for shipment over the early months of 1912, but most buyers are content to await developments before committing themselves to these high figures.

Nitrate of Soda.

Although no further advance has taken place, the market remains very firm, and prices are well maintained at 10s. 1½d. per cwt. for ordinary, and 10s. 4½d. for refined quality, on spot.

LONDON, *Oct.* 23.

Tar Products.

The markets for tar products remain exceedingly strong. Pitch is in very good demand and shows signs of improvement. Benzols are

THE "DARWEN" ARCH PIPE

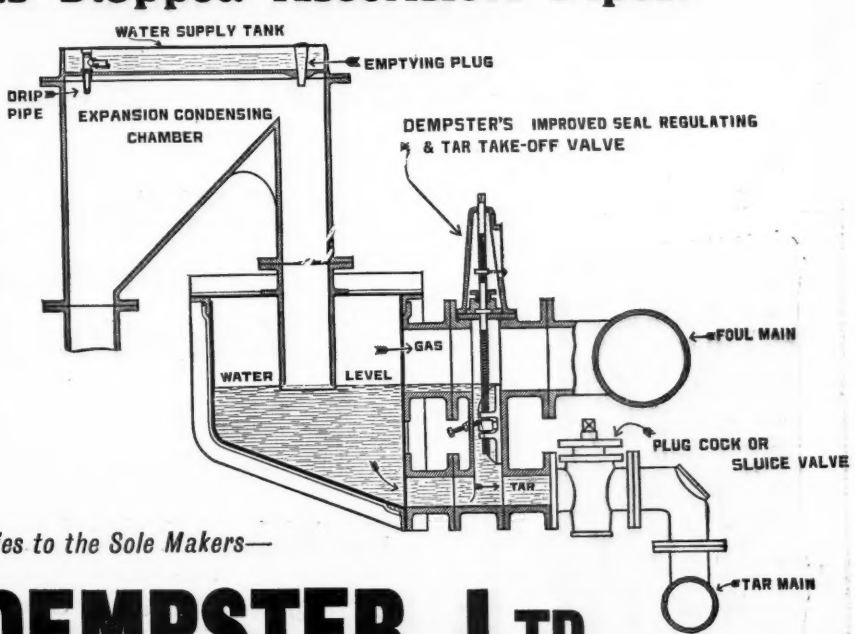
Prevents Stopped Ascension Pipes.

"The Cost is moderate and can be saved in a Single Season."

"The Arch Pipes can be seen in operation upon application."

"It will pay you to try them upon troublesome Pipes."

Upwards of 400 are already at Work or on Order.



Please address all Enquiries to the Sole Makers—

R. & J. DEMPSTER, LTD.,

GAS PLANT WORKS, **MANCHESTER.**

firm for near delivery; but there appears to be more stuff offering for forward. Solvent naphthas show indication of betterment; and there has been a little more inquiry for both prompt and forward delivery. Heavy naphtha is very steady. In creosote, the demand is exceptionally good for both prompt and forward delivery. Crude carbolic acid remains in about the same position. Consumers are willing to purchase when reasonable prices are asked.

The average values during the week were: Tar, 21s. to 25s. *ex* works. Pitch, London, 40s. 6d. to 41s. 6d.; east coast, 40s. to 41s.; west coast, Manchester 39s. 6d. to 40s. 6d., Liverpool 40s. to 41s., Clyde 40s. to 41s. Benzol, 90 per cent., naked, London 9¼d. to 10d. f.o.b. North, 9¼d. to 9½d. f.o.b.; 50-90 per cent., naked, London, 8½d., North, 8d. to 8½d. f.o.b. Toluol, naked, London, 8½d. to 9d.; North, 8d. to 8½d. Crude naphtha, in bulk, London, 4¼d. to 4⅜d.; North, 3¾d. to 4d. Solvent naphtha, naked, London, 9½d. to 9⅝d. f.o.b.; North, 8½d. to 9d. f.o.b. Heavy naphtha, naked, London, 10¼d. to 10½d. f.o.b.; North, 9d. to 10d. f.o.b. Creosote, in bulk, London, 2⅜d. to 2¾d.; North, 2⅛d. to 2⅜d. Heavy oils, in bulk, 3d. to 3⅛d. Carbolic acid, casks included, 60 per cent., west coast, 2s. to 2s. 1d.; east coast, 2s. 1d. to 2s. 2d. Naphthalene, £4 10s. to £10; salts, 42s. 6d. to 45s., bags included. Anthracene, "A" quality, 1¼d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article remains firm, but there has not been such a heavy demand during the past week. Actual Beckton is quoted at £13 16s. 3d.; outside London makes, £13 10s.; Hull, £14 2s. 6d.; Liverpool, £14 5s. to £14 6s. 3d.; Leith, £14 7s. 6d.; Middlesbrough, £14 2s. 6d.

Bury and District Joint Water Board Undertaking.—On the invitation of the Bury and District Joint Water Board, members of the Bury Town Council made an inspection on Friday last of five of the reservoirs which supply the area of the Board. Proceeding by motor bus and char-a-banc, the party first visited Calg Hey reservoir—the highest of the three in the Grane Valley, being 1000 feet above the sea level and with a holding capacity of 133,000,000 gallons. At the time of the visit, the reservoir only contained 23,000,000 gallons. The Ogden reservoir was next inspected. This has not yet been brought into service, and was the last constructed for the Board under the supervision of the late Engineer, Mr. Joshua Cartwright, at a cost of about £158,000. Afterwards the Holden reservoir was visited; and the party were informed that, when full, the three reservoirs at Grane contain 600,000,000 gallons, equivalent to one hundred days' supply. Last Friday, the total supply of water in the three reservoirs was 364,000,000 gallons, of which 330,000,000 gallons was in the new Ogden reservoir. Subsequently, and following lunch, the party went to the Hapton reservoir, which has a holding capacity of 327,000,000 gallons, but at the time of inspection only contained 27,000,000 gallons. The Cloughbottom reservoir was reached by way of Burnley and the Todmorden Road. This reservoir will hold 200,000,000 gallons.

COAL TRADE REPORTS.

Northern Coal Trade.

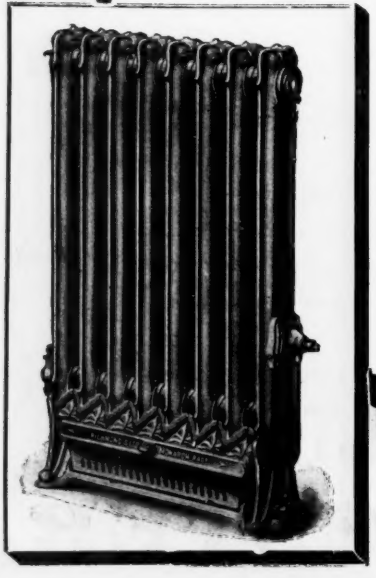
There has been a fuller demand for coal, with heavier shipments, though the high rates of sea-freights impede the exports in some directions. To Italy, for instance, freights on coal are fully 1s. per ton higher than before the outbreak of the war. Best Northumbrian steams are from 11s. 6d. to 11s. 10d. per ton f.o.b., second-class steams are from 9s. 6d. to 10s., and steam smalls from 5s. to 6s. In gas coals, the production is heavy, and is well taken up in general, as the home demand increases week by week. For Durham gas coals, slightly higher prices are asked. Best Durhams are 11s. 6d. to 11s. 9d. per ton f.o.b.; second class gas coals, 10s. to 10s. 4d.; and "Wear" specials, 11s. 9d. to 12s. There are some inquiries for cargoes of gas coal; but high freights induce caution in such sales, and also in forward contracts, especially to the Mediterranean. There are, however, rumours of competition from foreign gas coals at Italian ports, which may influence the prices there. Coke is steady. Gas coke is rather firmer at 13s. 9d. to 14s. 3d. per ton f.o.b. in the Tyne or Wear.

Scotch Coal Trade.

The market is still strong; the demand for both home and abroad being well maintained. Small stuffs are in great request for iron and steel works. The prices now quoted are: Ell, 10s. 3d. to 11s. 3d. per ton f.o.b. Glasgow; splint, 11s. 3d. to 11s. 6d.; steam, 9s. 6d. to 9s. 9d. The shipments for the week amounted to 360,642 tons—an increase on the previous week of 8529 tons, and on the corresponding week of 30,184 tons. For the year to date, the total shipments have been 13,001,172 tons—an increase on the corresponding period of 199,402 tons.

Southport Ironmongers and Corporation Trading.—At a meeting of the Southport Traders' Association last Thursday, the Secretary reported that at the last meeting of the Ironmongers' Association it was decided to send a letter to the various candidates at the pending municipal elections asking if they were in favour of discountenancing, as far as practicable, municipal trading, and that the requirements of the Corporation be supplied by local tradesmen. The members of the Ironmongers' Association thought that, instead of sending the resolution direct from their Association to the candidates, it would have more weight if it came from the Traders' Association. In the course of the discussion, Councillor Wood said they had made up their minds to have all accounts coming before the different Committees carefully scrutinized, so that nothing should go out of the town that could be kept in it. Councillor Ball asked if the ironmongers were not aiming at a curtailment of municipal trading. Mr. Seddon, for the Ironmongers' Association, said the question was not one of municipal trading but of purchasing, as far as possible, from the retail traders in the town. A resolution approving of the letter being sent out by the Traders' Association to the municipal candidates was carried.

Richmond's *Gas-Steam* Radiators.



Efficient, Economical, Interchangeable.

Large Stocks held and immediate despatch guaranteed of usual sizes.

The Richmond Gas Stove & Meter Co., LTD.,
Gas Heating Specialists,
132, Queen Victoria Street, London, E.C.
Offices & Works: WARRINGTON, ENGLAND.

Popular Lecture on Gas and its Application.

The second lecture of the autumn session of the Redcar and Coatham Literary Institute was delivered last Tuesday evening by Mr. Matt. Dunn, of Stockton-on-Tees; his subject being "Coal Gas: Its Manufacture and Application." The chair was occupied by Mr. Mark Fligg, the Secretary and Manager of the Redcar Gas Company; and there was a large and appreciative audience. Mr. Dunn first dealt with prehistoric methods of lighting, and then referred to ancient torches, lamps, fire-baskets, &c. Coming to the discovery of coal gas, he explained the process of its manufacture, and described its application for lighting, heating, domestic, and industrial purposes, with practical demonstrations. He next showed the effect of globes and wall-papers on lighting efficiency, and emphasized the hygienic advantages and ventilating power of gas lighting; concluding with some comparative values of various kinds of lighting, &c. To illustrate the lecture, a valuable collection of ancient lamps, bye-products, model gas-works, and modern gas appliances were on view; and much interest was evinced in them. At the close, Mr. Dunn was warmly thanked for his lecture.

An Elective Auditor's Criticism.

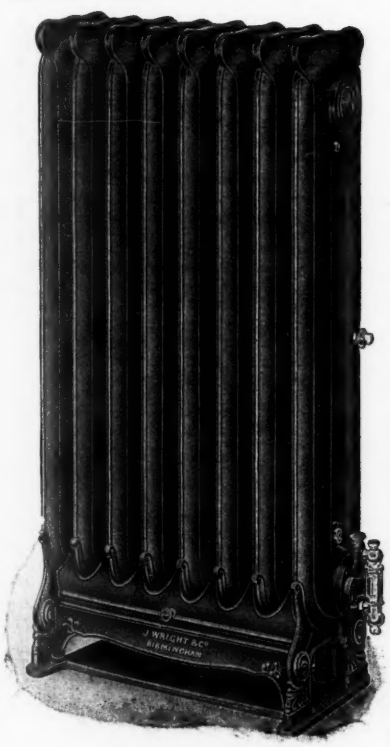
Mr. J. M. Labouchere, who is described as the "Socialist Elective Auditor for Liverpool," has been "letting himself go" over an interim report on city affairs. He touches on many matters; but as an illustration of the nature of his criticism, we may content ourselves with reproducing here what he has to say on the gas supply: "This subject ought to be dealt with at once; for the longer the delay, the greater becomes the injustice inflicted upon the ratepayers. At present they are not permitted to do for themselves what they could do better and cheaper than is done by the oligarchy who rule the gas lighting trust of the city. Our finances are deprived of the revenue of some £40,000 yearly, which should go to relieve the rates. Citizens are rightly indignant at the extortionate prices charged for gas compared with such charge elsewhere. The rate charged to Liverpool by the monopolists who rule us in the matter of lighting is nearly 100 per cent. more than is paid by even small towns in the vicinity. Why do our corporate administrators allow such a large sum to be deflected to the pockets of private interests? Has this not gone on long enough? In a near township a rate of 10d. per 1000 cubic feet is charged for gas for motive power, with 2d. discount per 1000 feet if the account be paid within three months. 'Slot' consumers are only charged 1d. for 50 cubic feet, equalling 1s. 8d. per 1000 feet; but to the same class of consumers in Liverpool the Gas Company monopolists charge 3s. 4d. per 1000 cubic feet, less 15 per cent., thus showing an overcharge of about 85 per cent. as compared with the former. The enormity of this overcharge is evident when it is known that gas can be made at from 4d. to 6d. per 1000 cubic feet."

Gas Explosion at the Birmingham Council House.

On Friday afternoon several persons were more or less injured, and considerable damage was caused, by a gas explosion in a room in the Birmingham Council House. Some workmen were engaged in fixing a new meter for high-pressure gas in a room known as the old engine-house, which stands on the left of the gateway leading to the quadrangle of the Council House from Chamberlain Square; and according to an official statement supplied to the Press by the Secretary of the Gas Department (Mr. R. S. Hilton), the explosion was the result of a misunderstanding as to the working of a valve in connection with the extension of the high-pressure gas-main running through Victoria Square. There is a 2-inch service pipe running from the main into the Council House; and it was necessary, for the purpose of the operations, that this supply should be temporarily cut off. Apparently one of the workmen made a mistake, with the result that when the valve controlling the main was again turned on, there was a violent explosion. Two passers-by were cut and burned; but the most serious injury was sustained by a Council House employee named Sprawson, who was thrown against an iron railing and sustained a fractured thigh and a wound on the forehead. The explosion was followed by a slight outbreak of fire, in extinguishing which (as well as in giving first aid to one of the injured) the Lord Mayor, Alderman Bowater, rendered good service.

Dear Coal and the Price of Gas.—The "Daily Mail" has been informed by the Gaslight and Coke Company that, in anticipation of coal being both dear and scarce this winter, all the principal gas companies have heavy stocks of coal on hand to meet all demands that will fall upon them. There will be no rise—possibly even a fall—in the prices charged by the Company.

New Water-Works for Ivybridge.—A public meeting of the ratepayers of Ivybridge last Friday formally approved of a scheme adopted by the District Council for a new water supply, and sanctioned an application to Parliament for powers to carry it out. The scheme, which has been prepared by Mr. H. Francis, M.Inst.C.E., provides for the impounding of the water of the Butterbrook, a Dartmoor stream, the drainage area of which is free from cultivated land or residences. It is proposed to build across the stream a masonry and concrete dam, 287 feet in length, with two wing walls. The maximum depth of the wall will be 20 feet; and the reservoir will contain 4 million gallons, and provide more than amply for the requirements of Ivybridge. The estimated cost of the works is about £8500. Mr. J. Chamberlain, the Chairman of the meeting, said the Council had had constant communications about the water supply from the Local Government Board. The old reservoir was on a poor foundation, and was unsatisfactory; and the supply had been inefficient. Mr. John Bayly, who moved the resolution approving the scheme, said the Council had taken plenty of time, and ought to be thanked for the amount of work done and the trouble they had gone to.



THE DURABILITY OF THE

St. ANDREW GAS-STEAM RADIATOR.

As the products of combustion do not enter the interior, and the whole apparatus is made of cast-iron—no steel or wrought-iron being used in its construction—and the loops are fitted together by malleable push nipples, which last as long as the loops themselves (steel nipples, should never be used), the radiator under ordinary circumstances will last a lifetime.

EXPERT ADVICE
Free of Charge.

The Chief of our Hot-Water Department is always prepared to do all in his power to afford assistance to Gas Officials in connection with Heating by Gas-Steam or by Hot-Water Radiators.

ADDRESS:
JOHN WRIGHT & Co.,
19 & 21, Queen Victoria St.,
LONDON, E.C.

Our Booklets "WARMTH AT WILL" give full particulars of many other advantages.

Can we send you a supply for distribution?

JOHN WRIGHT & CO.,
BIRMINGHAM.

281

Rector as Gas-Stove Inventor.—The Rev. F. Iliff, M.A., Rector of St. Peter's, Levenshulme, Manchester, has joined the ranks of gas-stove inventors. A stove made to his patent has been tested in a schoolroom, 49 ft. by 30 ft. 6 in. and 14 ft. 6 in. high, with satisfactory results; its special merits being, according to the inventor, an even temperature, which may be regulated at will, and economy, while it is free from draughts. The average cost is 1½d. to heat up to 69° Fahr., and 0·2d. per hour so long as this temperature is required and it necessitates compulsory fresh air. It is claimed that neither dust nor dirt accumulates in the working of the stove; and all fog is cleared out of the air before delivery.

Gas-Workers' Wages at Newcastle.—A deputation of the National Amalgamated Union of Labour, headed by Mr. Peter Millen, the official delegate, last Tuesday met Mr. T. Hardie, the Chief Engineer, and Mr. J. Lewis, the Superintendent of the Distribution Department, of the Newcastle and Gateshead Gas Company, on the question of an advance of wages for men employed in the distribution department at the South Street works. The application was for a minimum wage for all labourers of 26s. 6d. per week, and 35s. per week for pipe-layers. With regard to the labourers, an offer was made which was to be subsequently submitted to a mass meeting of the men. Consideration of the demand of the pipe-layers was deferred for a week.

Ashbourne Gas Purchase Question.—A special meeting of the Ashbourne Urban District Council was held last Tuesday to consider whether the Council should deposit a Bill for the purchase of the gas-works, under the Ashbourne Gas Company's Act. Mr. T. H. B. Bamford, J.P., presided, and explained that if they deposited the Bill they would not be bound to purchase. He proposed that the Council deposit a Bill. Mr. Osborne moved an amendment to the effect that the Council do not deposit a Bill until the Committee appointed to deal with the matter had satisfied them that the ratepayers would not be losers. On a vote being taken, the amendment was only supported by the mover and seconder. The resolution was carried by nine votes to two; and it was decided to call a meeting of the ratepayers.

Sedgley Gas Undertaking.—Addressing members of the Sedgley Urban District Council, the Chairman (Mr. L. Foster) said the output had increased by 1,200,000 cubic feet in six months; being the greatest increase they had known since they had had the gas-works. Their profits also were larger than ever. The introduction of slot-meters and gas-cookers had been more successful than any of them had anticipated. There were not half-a-dozen cookers in the whole parish that had not been used. They were selling as much gas as they could make; and they would in a short time have to enlarge their works. Mr. Morgan agreed that in the near future extensions would have to be made, either on the present site or on another more suitable one. The Gas Committee had, as a matter of fact, had under consideration the acquisition of another site contiguous to the railway; and if this scheme were adopted, they would save something like £300 per year—a sum that would more than compensate them for the changes they contemplated.

Mr. Kendrick's Paper on "Domestic Heating and Lighting by Gas."—Referring to the paper on the above-named subject recently read by Mr. Henry Kendrick, of Stretford, before the Manchester and Salford Ironmongers' Association, and noticed in the "JOURNAL" last week (p. 193), the writer of the notes under the heading of "Told after Shop Hours" in the "Ironmonger" says: "The paper was particularly suggestive and apposite. The lecturer's indication that in this department of service there is room for the exercise of special intelligence and knowledge, should commend his practical observations to careful consideration. The stress of modern competition is a well-worn theme; but a penetrating analysis of this competition will reveal the fact that much of it must collapse immediately it is fought scientifically. By this I simply mean that a skilful combination of common sense and knowledge can beat half the present-day competition clean out of the field. Take incandescent gas lighting as an illustration. There are wholesale firms who care not what the distributive channels of their wares are so long as they can maintain a big output. They advertise for 'agents,' not in the trade journals, but in the pages of the general press, and hold out alluring prospects of big profits to be made by selling burners and mantles. What kind of conditions are such sales as these certain to create? Most certainly those of dissatisfaction by the users. It does not need a great deal of acumen to detect here an opportunity for the trained salesman to benefit."

APPLICATIONS FOR LETTERS PATENT.

22,181.—ANDERSON, D., "Gas-lamps." Oct. 9.
22,183.—BERRY, J., GLOVER, W. T., and METERS LIMITED., "Valves for gas." Oct. 9.
22,234.—HOOKER, M., "Making air gas." Oct. 9.
22,308.—SHILTON, W. A., "Hydraulic mains." Oct. 10.
22,352.—NORTH, R. B., "Automatic gas lighters or controllers." Oct. 10.
22,357.—PÜNING, H., "Direct extraction of ammonia, in shape of a sulphate destitute of tar, from the gases of distillation of coal, peat, wood, and the like." Oct. 10.
22,386.—SILVESTER, H., and COCKS, J., "Coal-conveyors." Oct. 11.
22,530.—CARPENTER, C. C., "Gas-fires." Oct. 12.
22,531.—BRAUN, H., "Extracting nitrogen and carbonic acid from combustion gases." Oct. 12.
22,551.—TODMAN, J. C. T., "Acetylene generator." Oct. 12.
22,596.—BRAMLEY-MOORE, S., "Universal joints." Oct. 13.
22,654.—WALLWIN, J. M., "Gas-irons." Oct. 14.
22,662.—BRAMLEY-MOORE, S., "Governor." Oct. 14.
22,694.—SAMAIN, P., "Valves for water-mains." Oct. 14.

APPLICATION FOR RESTORATION OF LAPSED PATENT.

Notice is given that A. C. ROESSLER has made application for the restoration of the patent granted for "Improvements in and relating to rotary compressors," No. 10,558 of 1907, and bearing date May 6.

TO ENSURE

RELIABILITY, EFFICIENCY & ECONOMY

ORDER

"CANNON" GAS FIRES

PERFECT FINISH

ARTISTIC DESIGNS

EXPERT WORKMANSHIP.

Our List will interest you.

CANNON IRON FOUNDRIES, LTD.,

DEEPFIELDS, near BILSTON, STAFFS.

London Office and Show-Rooms: 18, HOLBORN VIADUCT, E.C.